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OHIO RIVER BASIN  
LITTLE SANDY CREEK, FAYETTE COUNTY

PENNSYLVANIA

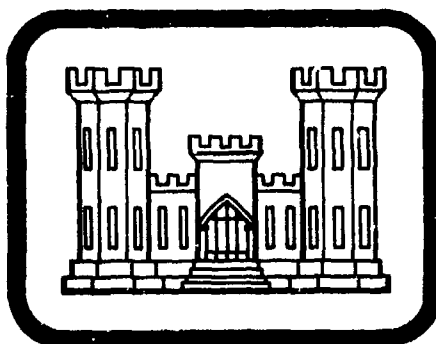
HERITAGE RESERVATION DAM

NDI LD. NO. PA-01142  
PENNDER LD. NO. 26-101

LEVEL II

~~ALLEGHENY TRAILS COUNCIL~~  
~~BOY SCOUTS OF AMERICA~~

PHASE I INSPECTION REPORT  
NATIONAL DAM INSPECTION PROGRAM



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PREPARED FOR  
**DACW31-81-C-0015**  
DEPARTMENT OF THE ARMY  
Baltimore District, Corps of Engineers  
Baltimore, Maryland 21203

PREPARED BY

GAI CONSULTANTS, INC.

570 BEATTY ROAD

MONROEVILLE, PENNSYLVANIA 15146

SEPTEMBER 1981

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# PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the Spillway Design Flood is based on the estimated Probable Maximum Flood (greatest reasonably possible storm runoff) for the region, or fractions thereof. The Spillway Design Flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition, and the downstream damage potential.

Breach analyses are performed, when necessary, to provide data to assess the potential for downstream damage and possible loss of life. The results are based on specific theoretical scenarios peculiar to the analysis of a particular dam and are not applicable to other related studies such as those conducted under the Federal Flood Insurance Program.

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PHASE I INSPECTION REPORT  
NATIONAL DAM INSPECTION PROGRAM

Heritage Reservation Dam: NDI I.D. No. PA-01142

Owner: Allegheny Trails Council, Boy Scouts of America  
State Located: Pennsylvania (PennDER I.D. No. 26-101)  
County Located: Fayette  
Stream: Little Sandy Creek  
Inspection Date: 1 July 1981  
Inspection Team: GAI Consultants, Inc.  
570 Beatty Road  
Monroeville, Pennsylvania 15146

Based on a visual inspection, operational history, and available engineering data, ~~the dam~~ is considered to be in excellent condition.

The size classification of the facility is intermediate and the hazard classification is considered to be high. In accordance with the recommended guidelines, the Spillway Design Flood (SDF) is considered to be the PMF (Probable Maximum Flood). Results of the hydrologic and hydraulic analysis indicate that the facility is capable of passing and/or storing the PMF without overtopping the dam or dike. Consequently, the spillway is considered adequate.

It is recommended that the owner immediately:

a. Develop formal manuals of operations and maintenance to ensure continued proper care and regular maintenance of the dam and its appurtenances.

b. Observe the wet conditions along the downstream embankment bench at the main dam and along the downstream toe of the dike in all future inspections, specifically noting any turbidity and/or changes in flow rate. In addition, resume the program of instrumentation monitoring (piezometer and settlement movement readings)


Heritage Reservation Dam: NDI I.D. No. PA-01142

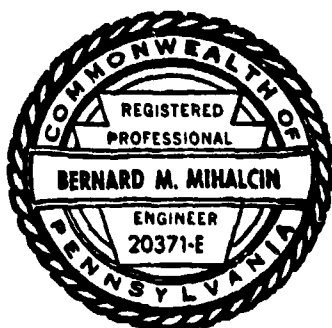
until steady state conditions develop and it can be concluded that the facility is functioning as designed.

GAI Consultants, Inc.

Approved by:

  
Bernard M. Mihalcin, P.E.

  
James W. Peck  
Colonel, Corps of Engineers  
Commander and District Engineer



Date: 10 Sept 1981

Date: 18 Sept 1981



OVERVIEW PHOTOGRAPH

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PHASE I INSPECTION REPORT  
NATIONAL DAM INSPECTION PROGRAM  
HERITAGE RESERVATION DAM  
NDI NO. PA-01142, PENNDER NO. 26-101

SECTION 1  
GENERAL INFORMATION

1.0 Authority.

The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers to initiate a program of inspection of dams throughout the United States.

1.1 Purpose.

The purpose is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project.

a. Dam and Appurtenances. Heritage Reservation Dam is a 66-foot high earth embankment approximately 770 feet long. The structure is equipped with both service and emergency spillways. The service spillway is located along the upstream embankment toe near the center of the embankment. It is a single-stage, reinforced concrete, drop inlet-type, vertical riser connected to a 36-inch diameter, horizontal, concrete conduit at its base. The emergency spillway is a trapezoidal shaped channel cut through rock in the right abutment. The channel is 125 feet wide at its crest which is defined by a 18-inch thick concrete sillwall. The facility is provided with a reservoir drain consisting of a 36-inch by 48-inch intake situated along the upstream face of the service spillway riser. Flows through the intake are controlled by a 48-inch by 48-inch sluice gate that is manually operated from atop the riser. The riser is also equipped with a 6-inch diameter gate along its downstream face which is used to augment stream flows during periods of low pools.

In addition to the main embankment, a 27-foot high, 1,600-foot long earth dike, curved in plan, is constructed to protect a low area along the ridge at the perimeter of the reservoir northwest of the main embankment.

b. Location. Heritage Reservation Dam is located on Little Sandy Creek in Wharton Township, Fayette County, Pennsylvania. The facility is situated off U.S. Route 40 approximately 1.7 miles southeast of the community of Farmington, Pennsylvania. The dam and reservoir are contained within the Fort Necessity, Pennsylvania, 7.5 minute U.S.G.S. topographic quadrangle (see Figure 1, Appendix E). The coordinates of the dam are N 39° 45.2' and W 79° 33.1'.



c. Size Classification. Intermediate (66 feet high, 8,800 acre-feet storage capacity at top of dam).

d. Hazard Classification. High (see Section 3.1.e).

e. Ownership. Allegheny Trails Council  
Boy Scouts of America  
Flag Plaza  
Pittsburgh, Pennsylvania 15219  
Attn: Ronald E. Moranville  
Secretary

f. Purpose. Recreation.

g. Historical Data. Heritage Reservation Dam was constructed in conjunction with Heritage Reservation, a 1,500-acre recreation facility developed by the Allegheny Trails Council of the Boy Scouts of America, Pittsburgh, Pennsylvania. The reservation provides a camping and outdoor activities facility for Boy Scout troops associated with Allegheny Trails Council. The dam was designed by D'Appolonia Consulting Engineers, Inc. of Pittsburgh, Pennsylvania and constructed by Engineered Construction International, Inc. (ECI), also of Pittsburgh. Construction began in June 1979 and was substantially completed by November of that same year. The facility has been in operation for just over one year. No significant problems have been incurred.

### 1.3 Pertinent Data.

a. Drainage Area (square miles). 5.8

b. Discharge at Dam Site.

Discharge Capacity of Reservoir Drain - Discharge capacity table contained in design report (see Appendix D, Sheet 3).

Discharge Capacity of Service Spillway at Maximum Pool  $\approx$  175 cfs (see Appendix D, Sheet 3).

Discharge Capacity of Emergency Spillway at Maximum Pool  $\approx$  10,570 cfs (see Appendix D, Sheet 4).

c. Elevations (feet above mean sea level). The following elevations were obtained from available drawings and through field measurements based on the elevation of the center of the emergency spillway crest at 2098.0 feet (see Appendix D, Sheet 1).

|                        |                         |
|------------------------|-------------------------|
| Top of Dam             | 2108 (design).          |
|                        | 2108 (field).           |
| Maximum Design Pool    | 2108                    |
| Maximum Pool of Record | Not known.              |
| Normal Pool (Summer)   | 2096 (May 1 to Oct. 1). |

|                                   |                                   |
|-----------------------------------|-----------------------------------|
| Normal Pool (Winter)              | 2086 (Oct. 1 to Dec. 1).          |
| Service Spillway Crest            | 2096                              |
| Service Spillway Outlet<br>Invert | 2044                              |
| Emergency Spillway Crest          | 2098                              |
| Reservoir Drain Invert            | 2058                              |
| Top of Dike                       | 2108 (design).<br>2108.7 (field). |
| Downstream Dike Toe               | 2080.8                            |
| Base of Impact Basin              | 2041.7                            |
| Streambed at Dam Centerline       | 2043                              |

d. Reservoir Length (feet).

|             |       |
|-------------|-------|
| Top of Dam  | 7,300 |
| Normal Pool | 6,000 |

e. Storage (acre-feet).

|                      |       |
|----------------------|-------|
| Top of Dam           | 8,800 |
| Normal Pool (Summer) | 5,300 |
| Normal Pool (Winter) | 3,100 |

f. Reservoir Surface (acres).

|                      |     |
|----------------------|-----|
| Top of Dam           | 352 |
| Normal Pool (Summer) | 252 |
| Normal Pool (Winter) | 180 |

g. Dam.

|                                       |   |
|---------------------------------------|---|
| Type                                  | Zoned earth and rockfill.   |
| Length                                | 770 feet (excluding spillway).  |
| Height                                | 66 feet (field measured;<br>embankment crest to base of<br>impact basin). |
| Top Width                             | 14 feet (design).<br>13 feet (field).                                     |
| Upstream Slope (above<br>normal pool) | 2H:1V (design).<br>2H:1V (field).   |
| Downstream Slope<br>Upper             | 2.5H:1V (design).<br>2.5H:1V (field).                                     |
| Lower                                 | 2.5H:1V (design).<br>2H:1V (field).                                       |

|                                    |   |
|------------------------------------|---|
| Width of Downstream Berm           | 17 feet (field. It is noted that design drawings indicate two 10-foot wide berms along the downstream embankment face. However, only the upper berm is clearly distinguishable in the as-built structure. See Figure 5 and Photograph 3). |
| Zoning                             | Four zones described in detail in Figure 5.   |
| Impervious Core                    | Zone 1 is reportedly comprised of the more clayey and plastic material available from the borrow area.  |
| Cutoff                             | 20-foot wide trench reportedly excavated to rock along embankment centerline and backfilled with Zone 1 material.   |
| Grout Curtain                      | Right abutment(see Figure 5).   |
| h. <u>Dike.</u>                    |   |
| Type                               | Zoned earth.  |
| Length                             | 1,600 feet.   |
| Height                             | 27 feet (field measured; dike crest to downstream dike toe).  |
| Top Width                          | 14 feet (design).<br>25 feet (field).   |
| Upstream Slope (above normal pool) | 2H:1V (design).<br>2H:1V (field).   |
| Downstream Slope                   |   |
| Upper                              | 2.25H:1V (design).<br>2H:1V (field).  |
| Lower                              | 2.5H:1V (design).<br>2.5H:1V (field).   |

|                                   |   |
|-----------------------------------|---|
| Width of Downstream Berm          | 10 feet (design).<br>10 feet (field).   |
| Internal Features                 | The dike is zoned similarly to the main embankment (see Figure 7).  |
| Grout Curtain                     | None indicated.   |
| i. <u>Service Spillway.</u>       |   |
| Type                              | Single stage, reinforced concrete, drop inlet-type, vertical riser connected to a 36-inch diameter, horizontal, concrete conduit at its base.   |
| Crest Elevation                   | 2096.0 feet.  |
| j. <u>Emergency Spillway.</u>     |   |
| Type                              | Trapezoidal shaped, grass lined channel cut through rock in the right abutment. Spillway crest is defined by an 18-inch wide concrete sillwall. |
| Crest Elevation                   | 2098.0 feet.  |
| Crest Length                      | 125 feet.   |
| k. <u>Reservoir Drain.</u>        |   |
| Type                              | 36-inch by 48-inch opening along the upstream face of the service spillway riser (see Figures 8 and 9).   |
| Invert Elevation                  | 2058.0 feet.  |
| Closure and Regulating Facilities | Control is provided by a 48-inch square slide gate mounted on the outside face of the service spillway riser and operated from atop the riser.  |

## SECTION 2 ENGINEERING DATA

### 2.1 Design.

a. Design Data Availability and Sources. A complete documentation of the design and construction of Heritage Reservation Dam is contained in a set of five formal reports available from the owner, engineer and PennDER. These reports were prepared by D'Appolonia Consulting Engineers, Inc. of Pittsburgh, Pennsylvania, and include the following:

- "Design Report", dated May, 1979.
- "Design Calculations, Hydrologic and Hydraulic Analyses", dated June, 1979,
- "Addendum Design Report", dated July, 1979.
- "Construction Photographs", dated March, 1980.
- "As-Built Report", dated March, 1980.

b. Design Features.

1. Dam. Design and as-built features of the dam are presented in Figures 3 and 5 (Note: Some of the dimensions contained in the figures vary slightly from field measurements). As indicated, the structure was designed as a zoned earth and rockfill embankment. All visible portions of the embankment slopes consist of rockfill. The downstream embankment face is sloped at 2.5H:1V and was designed with 10-foot wide berms at elevations 2081 and 2057. The lower berm is covered with large sandstone type boulders and is fairly indistinguishable from the remainder of the slope. The upstream embankment face is sloped at 3H:1V below normal summer pool and 2H:1V between normal summer pool and the embankment crest. Rockfill covers a majority of the upstream face extending from the crest to elevation 2058.

The section depicted in Figure 5 shows typical as-built internal features of the embankment. The dam incorporates a central core zone of select material (Zone 1) consisting of the more clayey, more plastic materials available. Zone 2 material reportedly consists of low plasticity soils containing rock fragments of 9-inch diameter or less. An 18-inch wide vertical chimney drain and a series of horizontal underdrains are also provided.

The embankment foundation was reportedly stripped of essentially all overburden material to the top of the underlying weathered sandstone. A 20-foot wide cutoff trench was founded in either sandstone or shale along the axis of the dam.

## 2. Appurtenant Structures.

a) Dike. Design features of the dike are presented in Figures 4 and 7. As indicated, the structure was designed as a zoned earthfill embankment similar to the main dam. The dike is constructed with a cutoff trench along its centerline that is founded on weathered shale. A series of horizontal sand drains were installed in the foundation downstream of the cutoff trench. Materials used for the dike construction generally consisted of brown weathered shale and brown silty clay with rock fragments. The finished structure was hydroseeded and sandstone riprap was placed along the upstream dike face between elevations 2100 and 2084.

b) Service Spillway. Design features of the service spillway are presented in Figures 8 and 9. As indicated, the service spillway is a single-stage, drop inlet-type structure consisting of a reinforced concrete riser and a 36-inch diameter reinforced concrete discharge conduit.

c) Emergency Spillway. Design features of the emergency spillway are presented in Figures 3, 6 and 8. As indicated, the emergency spillway is a trapezoidal shaped channel cut in rock through the right abutment. The channel is about 800 feet long and has a base crest width of 125 feet. Its control section is defined by a 18-inch wide concrete sillwall imbedded 4 feet into the channel. The channel is provided with 10 feet of available freeboard between its crest and the top of the dam.

d) Reservoir Drain. Drawdown capability is provided by a 48-inch by 48-inch stainless steel gate that covers a 36-inch by 48-inch opening along the upstream face of the service spillway riser at elevation 2058. The gate is manually operated from atop the riser (see Figures 8 and 9).

### c. Specific Design Data and Criteria.

1. Hydrology and Hydraulics. Specific data related to the hydrologic and hydraulic design of Heritage Reservation Dam are briefly discussed in Section 5.1 of this report.

2. Dam and Dike. Available design information includes all the basic elements of earth dam design. Embankment materials information with respect to local soils classifications, moisture-density relationships, consolidation, and permeability data are all presented in the various reports prepared by D'Appolonia.

Stability analyses of the dam and dike were conducted utilizing the STABL I computer program developed at Purdue University. The soil parameters utilized in the analyses were determined from laboratory tests on soil samples taken during the exploration program.

Loading conditions considered include:

- a) Long-term, steady-state seepage.
- b) Long-term, steady-state seepage with horizontal earthquake loadings of 0.1g.
- c) End of construction.
- d) Instantaneous reservoir drawdown from normal pool, elevation 2096, to elevation 2058, the invert of the water control gate.

The results of the analyses report that, for each loading condition, the minimum factors of safety determined were equal to or greater than the required factors of safety as recommended by the U.S. Army, Corps of Engineers.

3. Appurtenant Structures. The service spillway and reservoir drain designs incorporated into this facility are based on proven standards developed by the U.S. Department of Agriculture, Soil Conservation Service (SCS). Design data are presented in the design report.

## 2.2 Construction Records.

A fully documented construction history is contained within the reports entitled "As-Built Report" and "Construction Photographs", both dated March, 1980.

## 2.3 Operational Records.

No records of the daily operation of this facility are maintained. Instrumentation associated with the facility, such as piezometers and construction monuments, were monitored through October 1980 on a regular basis and the data are available from D'Appolonia. At present, the instrumentation is not being monitored on a regular basis.

## 2.4 Other Investigations.

No other formal investigations have been performed on this facility subsequent to its completion.

## 2.5 Evaluation.

Comprehensive engineering and construction data are available sufficient to indicate the structure was formally designed and

constructed in accordance with accepted modern engineering practices. Monitoring of the instrumentation was initiated during construction, but, was terminated in October 1980, shortly after reservoir fill-up. Reactivation of the monitoring program is recommended until it is determined that steady state conditions have developed within the embankment.



### SECTION 3 VISUAL INSPECTION

#### 3.1 Observations.

a. General. The general appearance of this project indicates the dam and its appurtenances are currently in good condition.

b. Dam. Observations made during the visual inspection indicate the dam is in excellent condition. No evidence of sloughing, erosion, excessive settlement, animal burrows, or signs of maintenance neglect were observed (see Photographs 1 and 2). Wet areas were observed at several locations along the downstream access berm (see Photograph 5); however, the condition could be the result of infiltration of the rock shell from overnight rains. Review of PennDER files indicated that the condition was observed previously and was described as "numerous point seeps". Discussions with the engineer and review of available piezometer data did not indicate clearly the source of this condition. Seepage and/or abutment leakage is visible at several other locations as indicated on the field sketch contained in Appendix A (see "Heritage Reservation Dam, General Plan - Field Inspection Notes"). None of the observed seepage is considered significant at this time.

#### c. Appurtenant Structures.

1. Dike. Based on visual observations, the dike is considered to be in excellent condition (See Photographs 9 and 10). No evidence of sloughing, erosion, seepage through the downstream dike face, settlement, animal burrows, or signs of maintenance neglect were observed. Wet conditions were observed along the downstream dike toe (see Photograph 11). However, this is probably the result of discharge through the horizontal finger drain system and is not considered to be significant.

2. Service Spillway. The service spillway drop inlet, reinforced concrete riser and outlet impact structure appear to be in excellent condition. No cracks or signs of weathering were observed on the exposed concrete surfaces of the structures. No evidence of corrosion was observed on exposed metal surfaces (see Photographs 6 and 7).

3. Emergency Spillway. Visual observations indicate that the emergency spillway is in good condition (see Photographs 3 and 4). Numerous leaks ( $\approx$  50 to 60 gpm) were observed emanating from the bedrock foundation through which the channel is cut. At present, the observed condition is not considered to be significant.

4. Reservoir Drain. The reservoir drain is reportedly functional and in excellent condition. The control gate was not operated in the presence of the inspection team; however, it reportedly will be opened in the fall in order to lower the reservoir prior to the winter season.

d. Reservoir Area. The general area surrounding the reservoir is comprised of moderate to steep, heavily forested slopes. No signs of slope distress were observed.

e. Downstream Channel. The channels immediately downstream of both the dam and dike are characterized as steep and set in narrow valleys with steep and heavily forested confining slopes. The two streams converge less than 2.2 miles below the dam. About 1.6 miles further downstream, Little Sandy Creek flows through the community of Gibbon Glade, Pennsylvania. According to a downstream inundation map prepared by D'Appolonia (see Figure 10) as part of the "Emergency Warning System and Evacuation Plan" for this facility, as many as 17 separate structures, including homes and small businesses, could be affected by an embankment breach. It is estimated that approximately 50 lives could be affected by such an event. As a result, the hazard classification is considered to be high.

### 3.2 Evaluation.

Based strictly on visual observations, the general condition of the facility is considered excellent. Various wet conditions are associated with the dam and dike, but, for the most part, are considered to be minor deficiencies requiring regular observation rather than immediate remedial attention.

## SECTION 4 OPERATIONAL PROCEDURES

### 4.1 Normal Operating Procedure .

Heritage Reservation Dam is essentially a self-regulating facility. Excess inflow passes through the service spillway and into the discharge stream. Inflows in excess of the capacity of the service spillway are stored and/or discharged through the emergency spillway. Under normal operating conditions the reservoir drain is closed between the months of December through September. Planned operating procedures call for the drain to be opened each October 1 in order to draw down the reservoir approximately 10 feet to winter pool at elevation 2086 feet. The drawdown is intended to provide the opportunity for repairs and other work necessary to maintain the recreational areas surrounding the reservoir. The drain is to be re-closed in early December of each year in order to assure full pool by the following May. No formal operations manual is available.

### 4.2 Maintenance of Dam.

The facility, as designed, requires only limited maintenance which can be performed, as needed, by the Heritage Reservation maintenance staff. No formal maintenance manual is available.

### 4.3 Maintenance of Operating Facilities.

See Section 4.2 above.

### 4.4 Warning System.

A formal plan entitled "Emergency Warning System and Evacuation Plan, Heritage Reservation Dam and Reservoir, Permit No. 2679605, Wharton Township, Fayette County, Pennsylvania", dated November 1, 1979, is available from both the PennDER and the owner (see Figure 10).

### 4.5 Evaluation.

The facility is designed to be self-regulating and requires minimal maintenance. A formal emergency warning system is available. In addition, a brief "Schedule of Operations" is contained in the original design report, dated May 1979. Both of the above should be incorporated into a formal operations and maintenance manual which should also include a formal schedule of maintenance.

## SECTION 5 HYDROLOGIC/HYDRAULIC EVALUATION

### 5.1 Design Data.

A complete hydrologic/hydraulic analysis as prepared by the design engineer is available from PennDER files. The files contain all pertinent discharge rating curves and storage capacity curves for the facility, as well as all appropriate hydrograph and routing data.

The service and emergency spillways were designed such that the 100-year flood (4.25 inches rainfall in 6 hours) would pass through the service spillway without engaging the emergency spillway, and such that the PMF event (24.2 inches rainfall in 24 hours) would pass without overtopping the dam and appurtenant dike. The PMF inflow and outflow hydrographs were developed using the Dam Safety version of the HEC-1 computer program developed by the U.S. Army, Corps of Engineers, Hydrologic Engineering Center, Davis, California. The SCS loss rate procedure and dimensionless unit hydrograph options were employed in the HEC-1 analysis.

Due to difficulties encountered in the excavation of the emergency spillway channel, revisions were made to the original design, such that the width of the channel was reduced from 225 feet to 125 feet. Consequently, the design top of dam elevation was raised from 2106 feet to 2108 feet, in order to accommodate the PMF event without overtopping.

### 5.2 Experience Data.

The facility was completed in November 1979 and the emergency spillway has yet to discharge.

### 5.3 Visual Observations.

On the date of inspection, no conditions were observed that would indicate the spillway could not perform satisfactorily during a flood event, within the limits of its design capacity.

### 5.4 Method of Analysis.

The facility has been analyzed in accordance with the procedures and guidelines established by the U.S. Army, Corps of Engineers, Baltimore District, for Phase I hydrologic and hydraulic evaluations. The hydrologic and hydraulic design calculations pertaining to the sizing of the dam and the service and emergency spillways, contained in the design reports, were evaluated in order to ensure compliance with the recommended guidelines.

### 5.5 Summary of Analysis.

a. Spillway Design Flood (SDF). In accordance with the procedures and guidelines contained in the National Guidelines for Safety Inspection of Dams for Phase I Investigations, the Spillway Design Flood (SDF) for Heritage Reservation Dam is the Probable Maximum Flood (PMF). This classification is based on the relative size of the dam (intermediate), and on the potential hazard of dam failure to downstream developments (high).

b. Results of Analysis. The service and emergency spillways at Heritage Reservation Dam were designed to accommodate the PMF prior to embankment overtopping. The service spillway consists of a standard SCS reinforced concrete, drop inlet-type riser structure, connected to a 36-inch diameter, reinforced concrete outlet conduit. The emergency spillway consists of a trapezoidal shaped channel cut in rock at the right abutment.

According to data contained within the design report, under PMF conditions, the peak inflow into the reservoir was approximately 25,160 cfs. The resulting peak outflow was about 10,610 cfs, corresponding to a maximum reservoir elevation of approximately 2107.9 feet, or 0.1-foot below the top of the dam. The spillway discharge rating curves, storage capacity curves, and the HEC-1 summary input and output are provided in Appendix D.

### 5.6 Spillway Adequacy.

Since the reservoir and spillway system at Heritage Reservation Dam are capable of accommodating the PMF (SDF) without overtopping of the dam and/or dike, the spillway system is deemed adequate.

## SECTION 6 EVALUATION OF STRUCTURAL INTEGRITY

### 6.1 Visual Observations.

a. Dam. Based on visual observations, the dam is considered to be in excellent condition. Construction photographs and reports indicate the facility was well constructed. The source of the wet areas along the downstream bench could not be determined based strictly on observations and available piezometer data. Consequently, a regular program of instrumentation monitoring and observation is considered necessary in order for any changes in existing conditions to be recorded and evaluated.

#### b. Appurtenant Structures.

1. Dike. The dike was also observed to be in excellent condition. Ponding observed at the downstream toe is likely due to discharge from the horizontal finger drain system and is not considered to be significant at present.

2. Service Spillway. Concrete structures (riser and impact basin) associated with the service spillway were observed to be in excellent condition. No cracking, spalling or other types of concrete deterioration were evident.

3. Emergency Spillway. The emergency spillway was observed to be in good condition. Substantial seepage was noted throughout the discharge channel. The channel is primarily cut into resistant sandstone, and therefore, the seepage is not considered to be a detriment to its operation.

### 6.2 Design and Construction Techniques.

Design, as-built and construction reports confirm that the facility was designed and constructed in accordance with accepted modern standards.

### 6.3 Past Performance.

Discussions with the owner's representative and engineer indicate the facility has performed adequately since its completion.

### 6.4 Seismic Stability.

The dam is located in Seismic Zone No. 1 and may be subject to minor earthquake induced dynamic forces. The design report indi-

( cates the facility was designed to resist expected earthquake induced dynamic forces.

## SECTION 7 ASSESSMENT AND RECOMMENDATIONS FOR REMEDIAL MEASURES

### 7.1 Dam Assessment.

a. Safety. The results of this investigation indicate the facility is in excellent condition.

The size classification of the facility is intermediate and the hazard classification is considered to be high. In accordance with the recommended guidelines, the Spillway Design Flood (SDF) is considered to be the PMF (Probable Maximum Flood). Results of the hydrologic and hydraulic analysis indicate that the facility is capable of passing and/or storing the PMF without overtopping the dam or dike. Consequently, the spillway is considered adequate.

b. Adequacy of Information. The available data is considered sufficient to make a reasonable Phase I assessment of the facility.

c. Urgency. The recommendations listed below should implemented immediately.

d. Necessity for Additional Investigations. No additional investigations are considered necessary at this time.

### 7.2 Recommendations/Remedial Measures.

It is recommended that the owner immediately:

a. Develop formal manuals of operations and maintenance to ensure continued proper care and regular maintenance of the dam and its appurtenances.

b. Observe the wet conditions along the downstream embankment bench at the main dam and along the downstream toe of the dike in all future inspections, specifically noting any turbidity and/or changes in flow rate. In addition, resume the program of instrumentation monitoring (piezometer and settlement movement readings) until steady state conditions develop and it can be concluded that the facility is functioning as designed.



8

APPENDIX A  
VISUAL INSPECTION CHECKLIST AND FIELD SKETCHES

# **CHECK LIST VISUAL INSPECTION PHASE 1**

NAME OF DAM Heritage Reservation Dam STATE Pennsylvania COUNTY Payette  
 NDI # PA 01142 PENNEDER # 26-101 HAZARD CATEGORY High  
 TYPE OF DAM Earth SIZE Intermediate TEMPERATURE 65° 10:00 a.m.  
 DATE(S) INSPECTION 1 July 1981 WEATHER Overcast  
 POOL ELEVATION AT TIME OF INSPECTION 2096.3 feet M.S.L.  
 TAILWATER AT TIME OF INSPECTION N/A M.S.L.

## **INSPECTION PERSONNEL**

B.M. Mihalcin  
D.J. Spaeder  
D.L. Bonk  
 \_\_\_\_\_  
 \_\_\_\_\_

## **OWNER REPRESENTATIVES**

Heritage Reservation  
Karl H. Lerz - Director  
of Properties and Development  
 \_\_\_\_\_  
 \_\_\_\_\_

## **OTHERS**

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

# **EMBANKMENT**

| ITEM   | OBSERVATIONS/REMARKS/RECOMMENDATIONS  | NDI# PA - 01142 |
|--|---|-----------------|
| SURFACE CRACKS   | None observed.  |                 |
| UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE      | None observed.  |                 |
| SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES | None observed.  |                 |
| VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST         | Horizontal - good.<br>Vertical - good (see profiles of dam and dike crests contained in Appendix A).        |                 |
| RIPRAP FAILURES  | Entire dam embankment is covered with sandstone boulders. Good condition. No riprap failures were observed. |                 |
| JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM  | Good condition.   |                 |

## EMBANKMENT

| ITEM   | OBSERVATIONS/REMARKS/RECOMMENDATIONS  | NDI# PA - 01142 |
|--|---|-----------------|
| DAMP AREAS<br>IRREGULAR VEGETA-<br>TION (LUSH OR DEAD<br>PLANTS) | Some minor ponding and general wet conditions were observed across the access berm situated along the downstream embankment face. Most of the water appears to be surface runoff generated by heavy overnight rains. Some of the observed moisture may be attributable to point seeps beneath the rock cover; however, this was not confirmed during the inspection.  |                 |
| ANY NOTICEABLE<br>SEEPAGE  | None observed through the downstream embankment face (see above). Minor abutment seepage evident at the left abutment near the embankment-abutment contact and at the right abutment within the emergency spillway channel.   |                 |
| STAFF GAGE AND<br>RECORDER                                       | None observed.  |                 |
| DRAINS   | Several finger drains observed protruding the downstream embankment toe to the left of the outlet conduit.  |                 |
| APPURTENANT DIKE   | 27-foot high, 1600-foot long earth dike spans a low area about 2000 feet north-west of the main embankment. Good condition. Grass covered dike crest and downstream face. Well graded sandstone riprap protects the upstream dike face. The dike is basically curved in plan. No evidence of seepage through the downstream face, sloughing, erosion or excess vegetation was observed. The area along the downstream dike toe is saturated. No measurable flow observed. |                 |

## OUTLET WORKS

| ITEM   | OBSERVATIONS/REMARKS/RECOMMENDATIONS   | NDIN PA. 01142 |
|--|--|----------------|
| INTAKE STRUCTURE   | Submerged, not observed. Intake is located along the upstream face of the service spillway riser about 10 feet above the base of the riser.  |                |
| OUTLET CONDUIT<br>(CRACKING AND<br>SPALLING OF CON-<br>CRETE SURFACES) | 36-inch diameter reinforced concrete pressure pipe discharges at the downstream embankment toe. Service spillway was discharging on the day of the inspection. Consequently, the outlet conduit could not be observed by the field team.                                     |                |
| OUTLET STRUCTURE   | Standard SCS-type concrete impact basin in good condition. No significant deterioration observed.  |                |
| OUTLET CHANNEL   | Rock lined trapezoidal shaped channel merges with natural stream about 500 feet downstream of the impact basin.  |                |
| GATE(S) AND OPERA-<br>TIONAL EQUIPMENT                                 | 48-inch by 48-inch water control gate located on the upstream face of the service spillway riser and manually operated from atop the riser. Not operated in the presence of the inspection team.   |                |
| LOW FLOW OUTLET  | Six inch diameter inlet situated along the downstream face of the service spillway riser about 18 feet above the base of the riser. Controlled via six inch diameter gate valve, manually operated from atop the riser. Not operated in the presence of the inspection team. |                |

# EMERGENCY SPILLWAY

| ITEM                             | OBSERVATIONS/REMARKS/RECOMMENDATIONS   | NDI# PA. 01142 |
|----------------------------------|--|----------------|
| TYPE AND CONDITION               | 126-foot wide, trapezoidal shaped channel cut through rock at the right abutment. Good condition. Small concrete curb defines the channel crest.   |                |
| APPROACH CHANNEL                 | 100-foot portion of the rock cut channel upstream of the spillway crest.   |                |
| SPILLWAY CHANNEL AND SIDEWALLS   | Rock cut channel presently grass covered. Substantial abutment seepage ( $\approx 50$ gpm) evident within the channel. Seepage emanates from different points along the channel, some less than 10 feet below the elevation of the emergency spillway crest. |                |
| STILLING BASIN PLUNGE POOL       | None.  |                |
| DISCHARGE CHANNEL                | Discharges into a trapezoidal shaped, rock lined channel that quickly merges with the natural stream channel downstream.   |                |
| BRIDGE AND PIERS EMERGENCY GATES | None.  |                |

# **SERVICE SPILLWAY**

| ITEM               | OBSERVATIONS/REMARKS/RECOMMENDATIONS   | NDIN PA: 01142 |
|--------------------|--|----------------|
| TYPE AND CONDITION | Standard SCS-type, concrete riser design. Good condition. No significant deterioration observed. |                |
| APPROACH CHANNEL   | N/A.   |                |
| OUTLET STRUCTURE   | Standard SCS-type, concrete impact basin. Good condition.  |                |
| DISCHARGE CHANNEL  | See "Outlet Channel", page 4 of 8.   |                |
|                    |  |                |
|                    |  |                |

## INSTRUMENTATION

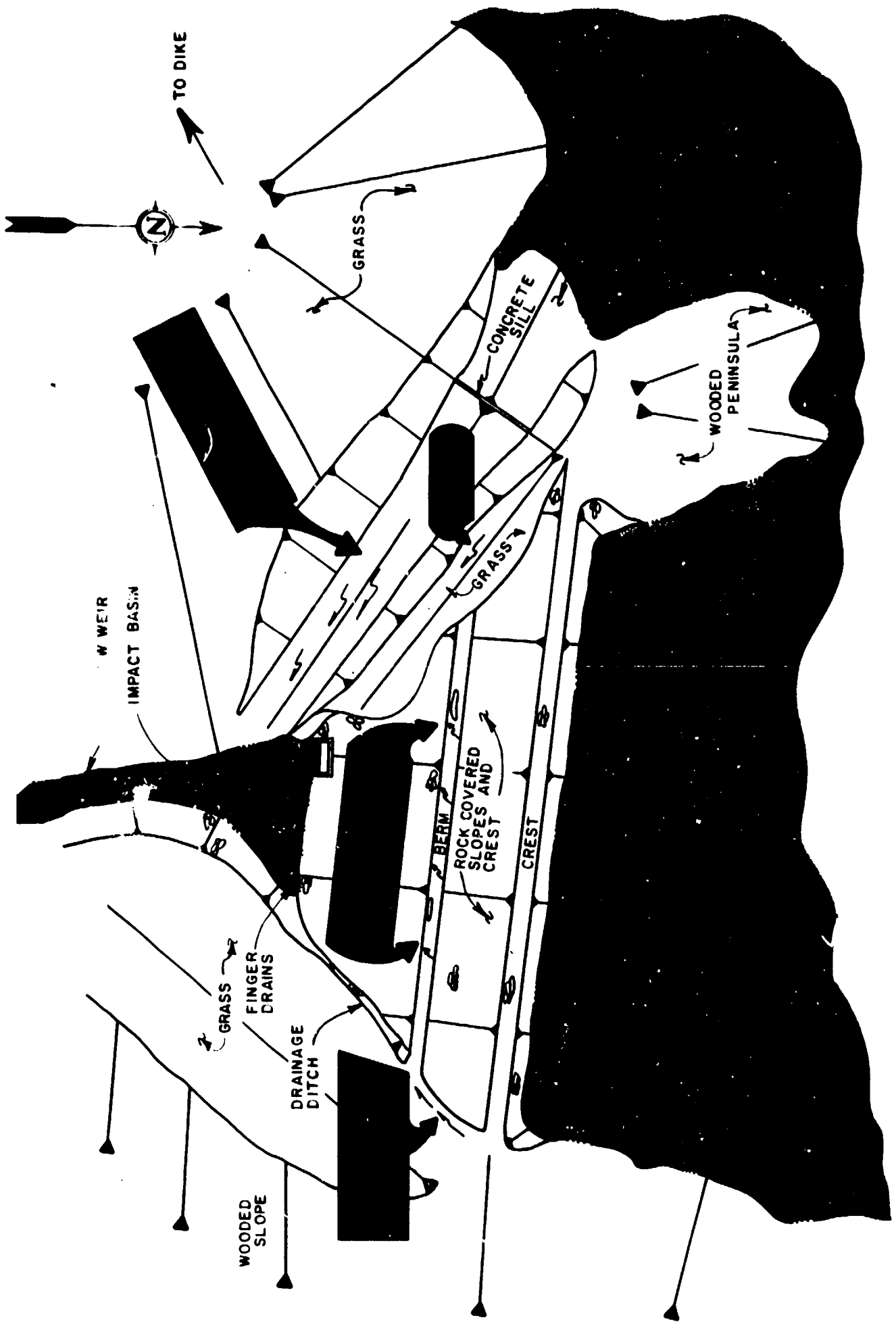
| ITEM                     | OBSERVATIONS/REMARKS/RECOMMENDATIONS  | NDI# PA - 01142 |
|--------------------------|---|-----------------|
| MONUMENTATION<br>SURVEYS | Three concrete survey monuments, used to monitor settlement across the embankment crest, were observed by the inspection team.                              |                 |
| OBSERVATION WELLS        | None.   |                 |
| WEIRS                    | Low flow weir situated across stream about 200 feet downstream of dam.  |                 |
| PIEZOMETERS              | Nine piezometers installed in the dam. Post construction monitoring data available from D'Appolonia Consulting Engineers, Inc. of Pittsburgh, Pennsylvania. |                 |
| OTHERS                   |   |                 |
|                          |   |                 |



# RESERVOIR AREA AND DOWNSTREAM CHANNEL

| ITEM  | OBSERVATIONS/REMARKS/RECOMMENDATIONS  | NDI# PA. 01142 |
|---|---|----------------|
| SLOPES:<br>RESERVOIR                            | Moderate to steep and heavily forested slopes.  |                |
| SEDIMENTATION                                   | None observed.  |                |
| DOWNSTREAM CHANNEL (OBSTRUCTIONS, DEBRIS, ETC.) | Stream passes through three small roadway culverts at Gibbon Glade.   |                |
| SLOPES:<br>CHANNEL<br>VALLEY                    | The channels downstream of both the dam and dike are characterized as steep and set in narrow valleys with steep and heavily forested confining slopes. The two streams converge less than 2.2 miles downstream of the dam.   |                |
| APPROXIMATE NUMBER OF HOMES AND POPULATION      | Gibbon Glade, Pennsylvania located about 3.8 miles downstream of Dam. As many as 17 separate structures, including homes and small businesses, could be affected by an embankment breach. It is estimated that approximately 50 lives could be affected by such an event. |                |
|   |   |                |

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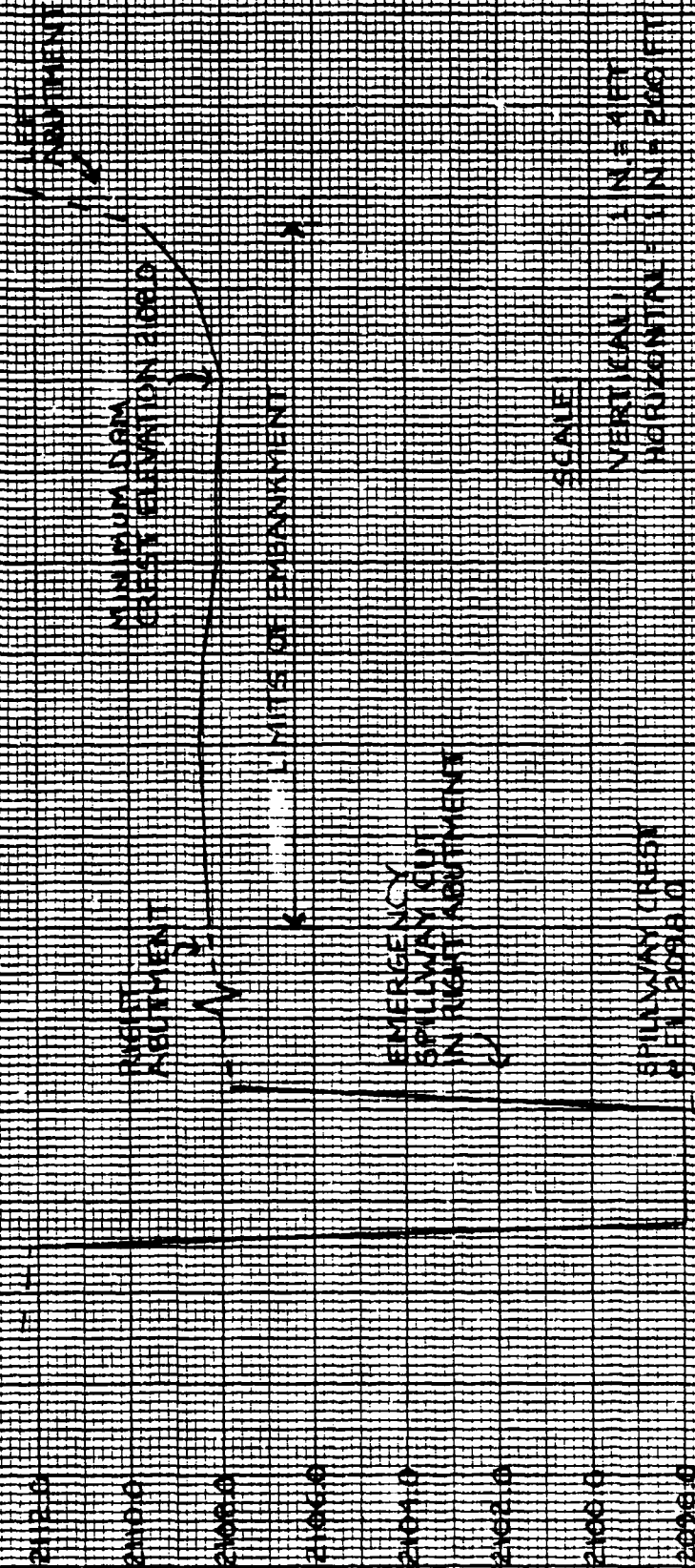


HERITAGE RESERVATION DAM  
GENERAL PLAN - FIELD INSPECTION NOTES

NOT TO SCALE

# HERITAGE RESERVOIR DAM

PROFILE OF DAM CREST  
FROM FIELD SURVEY



SUBJECT HERITAGE RESERVOIR DAM  
BY J. J. J. DATE 7-31-67 SHEET NO. 1 OF 2  
CWD BY J. J. J. DATE 7-31-67 PROJECT NO. 50-256-102

NOE # PA-101182

# HERITAGE RESERVATION DAM

PROFILE OF DIKE CREST  
FROM FIELD SURVEY

RIGHT  
ABUTMENT

212.0  
210.0  
208.0

MINIMUM DIKE  
CREST ELEVATION 208.1

LEFT  
ABUTMENT

SCALE

HORIZONTAL: 1 IN = 200 FT

VERTICAL: 1 IN = 4 FT

SUBJECT: HERITAGE RESERVATION DAM  
BY: [ ] DATE: 7-31-81 SHEET NO. 2 OF 2  
CHECKED BY: [ ] DATE: 7-31-81 PROJECT NO.: 02-01-142

APPENDIX B  
ENGINEERING DATA CHECKLIST

**CHECK LIST  
ENGINEERING DATA  
PHASE I**

NAME OF DAM Heritage Reservation Dam

| ITEM   | REMARKS   | NDH/PA- 01142 |
|--|---|---------------|
| PERSONS INTERVIEWED<br>AND TITLE                 | Allegheny Trails Council, Boy Scouts of America.<br>Karl H. Lerz, Director of Properties and Development, Heritage Reservation.   |               |
| REGIONAL VICINITY<br>MAP                         | See Figure 1, Appendix E.   |               |
| CONSTRUCTION<br>HISTORY                          | Designed by D'Appolonia Consulting Engineers, Inc. of Pittsburgh, Pennsylvania.<br>Construction history is contained in "As-Built Report" and "Construction Photographs". Facility was completed in November, 1979. Reports are available from the owner, engineer and PENNDEP. |               |
| AVAILABLE DRAWINGS                               | Approximately 65 drawings are available in "As-Built Report".   |               |
| TYPICAL DAM<br>SECTIONS                          | See Figures 5, 7 and 8, Appendix E.   |               |
| OUTLETS:<br>PLAN<br>DETAILS<br>DISCHARGE RATINGS | See Figures 8, 9, Appendix E. Discharge rating curves are available; see Appendix D, Sheets 3, 4.   |               |

**CHECK LIST  
ENGINEERING DATA  
PHASE I  
(CONTINUED)**

| ITEM  | REMARKS   | NDH PA - 01142 |
|---|---|----------------|
| SPILLWAY:<br>PLAN<br>SECTION<br>DETAILS   | Service and Emergency: See Figures 1, 6, 8, 9, Appendix E.  |                |
| OPERATING EQUIP.<br>MENT PLANS AND<br>DETAILS   | See Figure 9, Appendix E.   |                |
| DESIGN REPORTS  | "Design Report", "Addendum Design Report", and "Hydrology and Hydraulic Calculation Brief" as prepared by D'Appolonia Consulting Engineers, Inc., are available from owner, engineer, and PENNDEER. |                |
| GEOLOGY REPORTS   | Contained in "Design Report".   |                |
| DESIGN COMPUTATIONS:<br>HYDROLOGY AND<br>HYDRAULICS<br>STABILITY ANALYSES<br>SEEPAGE ANALYSES | Contained in "Design Report", "Addendum Design Report", and "Hydrology and Hydraulic Calculation Brief".  |                |
| MATERIAL<br>INVESTIGATIONS:<br>BORING RECORDS<br>LABORATORY TESTING<br>FIELD TESTING          | Contained in "Design Report" and "As-Built Report".   |                |

**CHECK LIST  
ENGINEERING DATA  
PHASE I  
(CONTINUED)**

| ITEM   | REMARKS  | NDI# PA - 01142 |
|--|--|-----------------|
| BORROW SOURCES   | Emergency spillway channel and various areas in and around the reservoir. See Sheet 3 of 65, "As-Built Report" (not included in Appendix E).               |                 |
| POST CONSTRUCTION<br>DAM SURVEYS                           | "As-Built" report available. Settlement monuments are located along the embankment crest. Post construction settlement data is available from D'Appolonia. |                 |
| POST CONSTRUCTION<br>ENGINEERING<br>STUDIES AND<br>REPORTS | None.  |                 |
| HIGH POOL RECORDS  | No formal records available. Emergency spillway has reportedly not discharged to date.   |                 |
| MONITORING SYSTEMS   | Piezometers and settlement monuments are monitored at present by D'Appolonia. The most recent available readings were taken in October, 1980.              |                 |
| MODIFICATIONS  | None since completion.   |                 |



**CHECK LIST  
ENGINEERING DATA  
PHASE I  
(CONTINUED)**

| ITEM  | REMARKS  | ND# PA · 01142 |
|---|--|----------------|
| PRIOR ACCIDENTS OR FAILURES                             | None.  |                |
| MAINTENANCE:<br>RECORDS<br>MANUAL                       | No formal maintenance manual is available.   |                |
| OPERATION:<br>RECORDS<br>MANUAL                         | No formal operations manual is available; however, a brief "Schedule of Operations" is contained in the "Design Report".                                     |                |
| OPERATIONAL<br>PROCEDURES                               | Self-regulating. Procedures for establishing normal winter pool approximately 10 feet below normal summer pool are outlined in the "Schedule of Operations". |                |
| WARNING SYSTEM<br>AND/OR<br>COMMUNICATION<br>FACILITIES | "Emergency Warning System and Evacuation Plan ...." dated November 1, 1979 is available from both the PennDER and the owner. See Figure 10, Appendix E.      |                |
| MISCELLANEOUS   |  |                |

GAI CONSULTANTS, INC.

CHECK LIST  
HYDROLOGIC AND HYDRAULIC  
ENGINEERING DATA

NDI ID # PA-01142  
PENNDER ID # 26-101

SIZE OF DRAINAGE AREA: 5.8 square miles.  
ELEVATION TOP NORMAL POOL: 2096.0 STORAGE CAPACITY: 5300 acre-feet.  
ELEVATION TOP FLOOD CONTROL POOL: - STORAGE CAPACITY: -  
ELEVATION MAXIMUM DESIGN POOL: - STORAGE CAPACITY: -  
ELEVATION TOP DAM: 2108.0 STORAGE CAPACITY: 8800 acre-feet.

SPILLWAY DATA

CREST ELEVATION: 2096.0 (service); 2098.0 (emergency).  
TYPE: SCS-type riser (service); rock-cut trapezoidal channel (emergency).  
CREST LENGTH: orifice opening (service); 126 feet (emergency).  
CHANNEL LENGTH: N/A (service); 430 feet (emergency; crest to downstream toe)  
SPILLOVER LOCATION: Near embankment center (service); right abutment (emergency)  
NUMBER AND TYPE OF GATES: None.

OUTLET WORKS

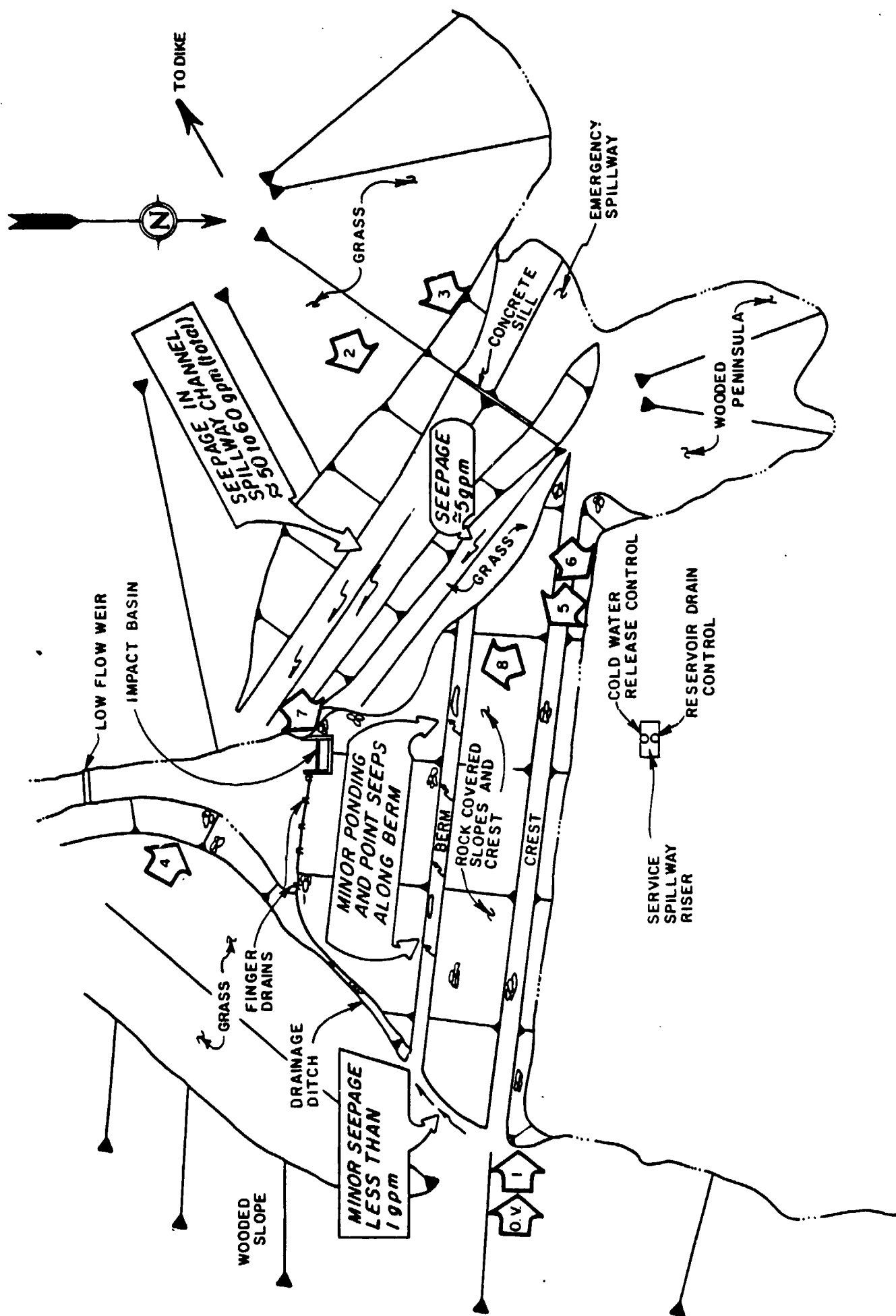
TYPE: 36-inch diameter reinforced concrete outlet conduit.  
LOCATION: Base of riser structure.  
ENTRANCE INVERTS: 2058.0 feet.  
EXIT INVERTS: 2044.0 feet.  
EMERGENCY DRAWDOWN FACILITIES: 4-foot by 4-foot slide gate that controls flow through a 3-foot by 4-foot opening on the upstream face of the riser tower.

HYDROMETEOROLOGICAL GAGES

TYPE: None.  
LOCATION: -  
RECORDS: -

MAXIMUM NON-DAMAGING DISCHARGE: Emergency spillway has reportedly not discharged to date.

**APPENDIX C**  
**PHOTOGRAPHS**



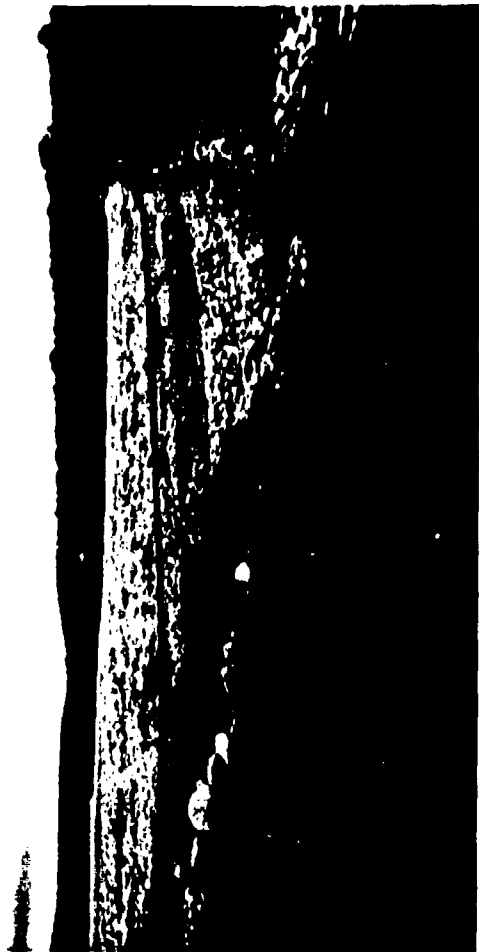
HERITAGE RESERVATION DAM  
PHOTOGRAPH KEY MAP

PHOTOGRAPH 1 Overview of Heritage Reservation Dam as seen from the left abutment.

PHOTOGRAPH 2 View of the downstream dam face looking toward the left abutment.

PHOTOGRAPH 3 View of the emergency spillway crest looking downstream from atop the right spillway sidewall.

PHOTOGRAPH 4 View, looking upstream, of the emergency spillway channel and service spillway impact structure.



2



4



1



3

PHOTOGRAPH 5 View of ponding observed along the berm situated on the downstream dam face.

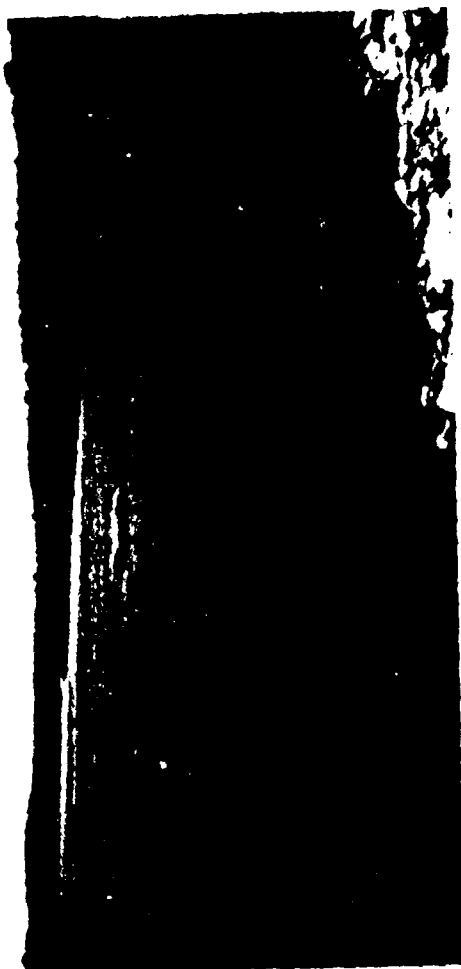
PHOTOGRAPH 6 View of the exposed top portion of the service spillway riser looking upstream from atop the dam crest.

PHOTOGRAPH 7 Close-up view of the service spillway impact basin situated at the downstream dam toe.

PHOTOGRAPH 8 View of the general area immediately downstream of the dam as seen from the dam crest.



8



6



7



5



PHOTOGRAPH 9 View of the crest and downstream face of the dike located about 2,000 feet northwest of the dam.

PHOTOGRAPH 10 View of the riprap lined upstream dike face looking toward its left abutment.

PHOTOGRAPH 11 View of minor ponding observed along the downstream dike toe.

PHOTOGRAPH 12 General view of the reservoir impounded by Heritage Reservation Dam as seen from an area situated between the dam and dike.



9



10



11



12

APPENDIX D  
HYDROLOGIC AND HYDRAULIC ANALYSES

SUBJECT

DAM SAFETY INSPECTION

BY

DJS

DATE

7-21-81

PROJ. NO.

80-238-142

CHKD. BY

DLB

DATE

7-29-81

SHEET NO.

1

OF

8Engineers • Geologists • Planners  
Environmental SpecialistsDAM STATISTICS

HEIGHT OF DAM = 66 FT (FIELD MEASURED: BASE OF IMPACT BASIN TO TOP OF DAM; "TOP OF DAM" HERE AND ON ALL SUBSEQUENT CALCULATION SHEETS REFERS TO THE MINIMUM ELEVATION ALONG THE EMBANKMENT CREST.)

HEIGHT OF DIKE = 87 FT (FIELD MEASURED: DOWNSTREAM TOE OF DIKE TO MINIMUM EMBANKMENT CREST ELEVATION.)

DRAINAGE AREA = 5.8 SQUARE MILES (PLANIMETERED ON USGS TOPO QUADS - FOOT NECESSITY, PA; OHIOPILE, PA; BRANDONVILLE, W. VA - PA; AND FRIENDSVILLE, MD - PA - W. VA.)

ELEVATIONS:

|  |   |        |                          |
|--|---|--------|--------------------------|
| TOP OF DAM (DESIGN)                              | = | 2108.0 | (FIG. 5)                 |
| TOP OF DAM (FIELD)                               | = | 2108.0 |                          |
| TOP OF DIKE (DESIGN)                             | = | 2108.0 | (FIG. 7)                 |
| TOP OF DIKE (FIELD)                              | = | 2108.2 |                          |
| EMERGENCY SPILLWAY CREST                         | = | 2098.0 | (FIG. 3)                 |
| SERVICE SPILLWAY CREST                           | = | 2096.0 | (FIG. 8)                 |
| NORMAL (SUMMER) POOL                             | = | 2096.0 | (FIG. 5)                 |
| WINTER POOL (DESIGN)                             | = | 2086.0 | (FIG. 5)                 |
| INVERT OF RESERVOIR DRAIN CONTROL GATE (DESIGN)  | = | 2058.0 | (FIG. 8)                 |
| RESERVOIR DRAIN & SERVICE SPILLWAY OUTLET INVERT | = | 2044.0 | (FIG. 8, FIELD MEASURED) |
| BASE OF IMPACT BASIN                             | = | 2041.7 | (FIG. 8)                 |
| STREAMBED @ DAM CENTERLINE                       | = | 2043   | (EST., FIG. 3)           |
| DOWNSTREAM TOE OF DIKE                           | = | 2080.8 | (FIELD)                  |

STORAGE CAPACITY @ NORMAL POOL = 5300 AC-FT (SHEET 3)

STORAGE CAPACITY @ TOP OF DAM = 8800 AC-FT (SHEET 3)

SUBJECT DAM SAFETY INSPECTION

HERITAGE RESERVATION DAM

BY DJS DATE 7-21-81 PROJ. NO. 80-238-142

CHKD. BY DLS DATE 7-29-81 SHEET NO. 2 OF 8



## DAM CLASSIFICATION

DAM SIZE: INTERMEDIATE (REF 1, TABLE 1)

HAZARD CLASSIFICATION: HIGH (FIELD OBSERVATION)

REQUIRED SDF: PMF (REF. 1, TABLE 3)

## DESIGN DATA

THE SERVICE AND EMERGENCY SPILLWAYS WERE DESIGNED SUCH THAT THE 100-YEAR FLOOD WOULD PASS WITHOUT DISCHARGING THROUGH THE EMERGENCY SPILLWAY, AND SUCH THAT THE PMF WOULD PASS WITHOUT OVERTOPPING THE DAM AND THE APPURTENANT DIKE. THE PMF INFLOW AND OUTFLOW HYDROGRAPHS WERE DEVELOPED BY USING THE MODIFIED HEC-1 PROGRAM, WITH EMPLOYMENT OF THE SCS DIMENSIONLESS UNIT HYDROGRAPH OPTION, AND WITH THE USE OF THE SCS LOSS RATE PROCEDURE (CURVE NUMBER METHOD).

THE PEAK INFLOW UNDER PMF CONDITIONS WAS APPROXIMATELY 25,160 CFS. THE RESULTING PEAK OUTFLOW WAS ABOUT 10,610 CFS, CORRESPONDING TO A MAXIMUM RESERVOIR ELEVATION OF 2107.9 FT. SINCE THE TOP OF DAM ELEVATION WAS FIELD MEASURED TO BE 2108.0 FT, IT IS CONCLUDED THAT THE SPILLWAY SYSTEM AT HERITAGE RESERVATION DAM IS ADEQUATE (THE EMERGENCY SPILLWAY WAS DETERMINED IN THE FIELD INSPECTION TO MEET DESIGN CONDITIONS).

THE PERTINENT HYDROLOGIC AND HYDRAULIC DESIGN DATA ARE PROVIDED ON THE FOLLOWING PAGES, AS OBTAINED FROM

"DESIGN REPORT"

"AS-BUILT REPORT"

"ADDENDUM DESIGN REPORT"

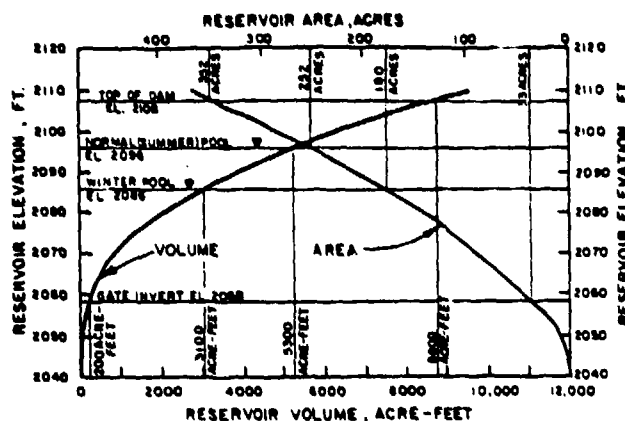
"HYDROLOGY AND HYDRAULIC CALCULATION BOOK"

HERITAGE RESERVATION DAM  
D'APPOINIA CONSULTING ENGINEERS, INC.  
DATED 1979, 1980

SUBJECT DAM SAFETY INSPECTION  
HERITAGE RESERVATION DAM  
 BY DJS DATE 7-21-81 PROJ. NO. 80-238-142  
 CHKD. BY DLO DATE 7-29-81 SHEET NO. 3 OF 8



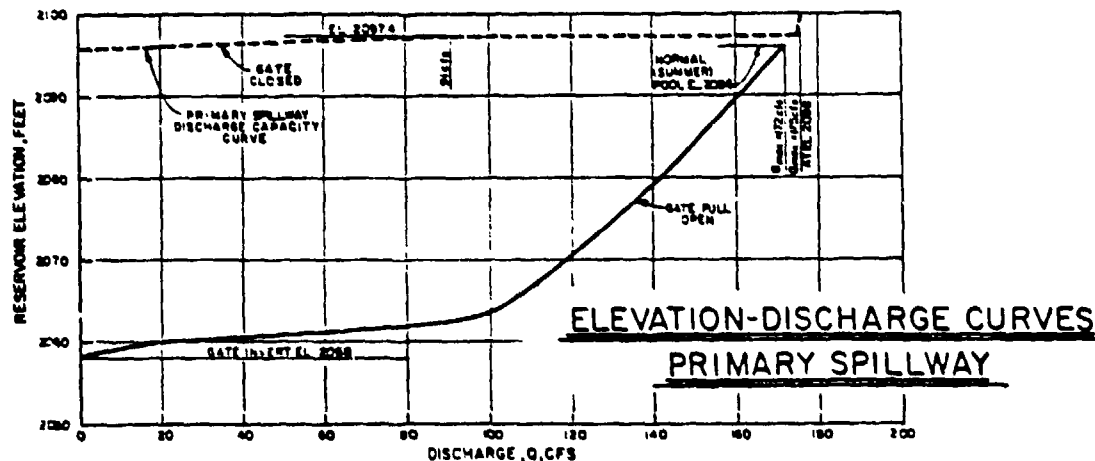
## STORAGE CAPACITY:



ELEVATION VS. RESERVOIR AREA  
AND RESERVOIR VOLUME

(FROM "AS-BUILT REPORT")

## CAPACITY OF SERVICE SPILLWAY AND RESERVOIR DRAIN:

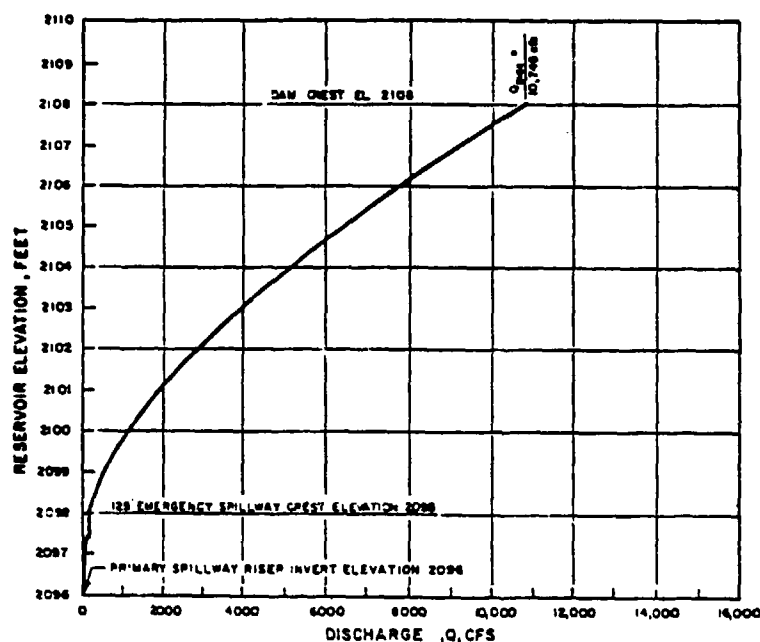


(FROM "AS-BUILT REPORT")

SUBJECT DAM SAFETY INSPECTION  
HERITAGE RESERVATION DAM  
 BY RJS DATE 7-21-81 PROJ. NO. 80-238-142  
 CHKD. BY DLB DATE 7-29-81 SHEET NO. 4 OF 8



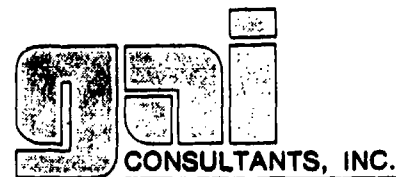
CAPACITY OF SERVICE SPILLWAY  
AND EMERGENCY SPILLWAY:



ELEVATION-DISCHARGE CURVE  
PRIMARY AND EMERGENCY SPILLWAYS

(FROM "AS-BUILT REPORT")

THE PRIMARY OR SERVICE SPILLWAY CONSISTS OF A STANDARD VCS - TYPE REINFORCED CONCRETE RISER STRUCTURE CONNECTED TO A 36-INCH DIAMETER REINFORCED CONCRETE OUTLET CONDUIT. THE RESERVOIR DRAIN CONSISTS OF A 4 FT X 4 FT SLIDE GATE THAT CONTROLS FLOW THROUGH A 3 FT X 4 FT OPENING ON THE UPSTREAM FACE OF THE RISER TOWER. THE EMERGENCY SPILLWAY CONSISTS OF A TRAPEZOIDAL CHANNEL CUT IN ROCK AT THE RIGHT ABUTMENT.

SUBJECT DAM SAFETY INSPECTIONHERITAGE RESERVATION DAMBY 255 DATE 7-21-81 PROJ. NO. 80-238-142CHKD. BY DLB DATE 7-29-81 SHEET NO. 5 OF 8Engineers • Geologists • Planners  
Environmental SpecialistsHEC-1 SUMMARY INPUT/OUTPUT :

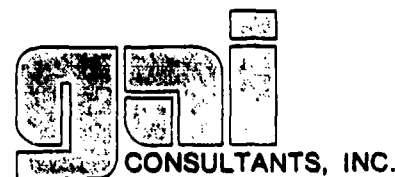
1 INPUT: A1 SNYDER UNIT HYDROGRAPH, DESIGN FLOOD ROUTING ANALYSIS  
 2 A2 FOR PMF, 3' PIPE AND RISER AT 2096, 125' BROADCREST EM. SPILLWAY AT 2098  
 3 A3 BOY SCOUT OF AMERICA DAM, FORT NECESSITY, FAYETTE COUNTY, PA (78-173-01)  
 4 B 300 0 10 0 0 0 0 0 0 0  
 5 R1 5  
 6 J 1 1 1  
 7 J1 1.00  
 8 K 0 1  
 9 K1 CALCULATION OF SCS INFLOW HYDROGRAPH TO PROPOSED LITTLE SANDY CREEK DAM  
 10 M 1 2 5.81 5.81 1  
 11 P 24.2 102 120 130 140  
 12 T -1 -65 0.0818  
 13 W2 1.13 ← BASIN LAG  
 14 X -1.0 -0.05 2.0  
 15 K 1 2  
 16 K1 ROUTING THROUGH 3' PIPE AND RISER AT EL. 2096, 125' BROADCREST AT EL. 2098  
 17 Y 1 1 1  
 18 Y1 1 5337.3 -1  
 19 TOTAL SPILLWAY RATING CURVE { Y42096.0 2097.0 2097.39 2097.4 2098.0 2099.0 2100.0 2101.0 2102.0 2103.0  
 20 Y42104.0 2105.0 2106.0 2107.0 2108.0 2109.0  
 21 Y5 0.0 55.8 91.2 173.9 175.0 510.4 1122.3 1914.2 2851.6 3914.7  
 22 Y55090.0 6367.0 7740.0 9200.9 10745.3 12368.9  
 23 STORAGE DATA { SS 0.0 12.3 260.3 950.3 2120.3 3861.3 5337.3 6321.3 9593.3  
 24 SE2043.0 2050.0 2060.0 2070.0 2080.0 2090.0 2096.0 2100.0 2110.0  
 25 SE2096.0  
 26 SE2110.0 3.08 1.5 800.0  
 27 K 99

ROUTING DATA:

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 HYDROGRAPH ROUTING  
 ROUTING THROUGH 3' PIPE AND RISER AT EL. 2096, 125' BROADCREST AT EL. 2098  
 ISTAR ICOMP IECON ITAPE JPLT JPRT INAME ISTAR IAUO  
 2 1 0 0 0 0 1 0 0  
 ROUTING DATA  
 CLOSS CLOSS AVG IRES ISAME IOPT IPMP LSTR  
 0.0 0.000 0.00 1 1 0 0 0  
 NSTPS NSTDL LAG AMSKK X TSK STORA ISPRAT  
 1 0 0 0.000 0.000 0.000 5337. -1  
 STAGE:  
 2096.00 2097.00 2097.39 2097.40 2098.00 2099.00 2100.00 2101.00  
 2104.00 2105.00 2106.00 2107.00 2108.00 2109.00  
 FLOW:  
 0.00 55.80 91.20 173.90 175.00 510.40 1122.30 1914.70  
 5090.00 6367.10 7740.00 9200.90 10745.30 12368.90  
 CAPACITY:  
 0. 12. 260. 950. 2120. 3861. 5337. 6321. 9593.  
 ELEVATION:  
 2043. 2050. 2060. 2070. 2080. 2090. 2096. 2100. 2110.  
 CREL SPWD COQW EXPW ELEVL CORL CANEA EXPL  
 2096.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0

2103.00  
2102.00  
2851.60  
3914.70



SUBJECT DAM SAFETY INSPECTIONHERITAGE RESERVATION DAMBY RTS DATE 7-21-81 PROJ. NO. 80-238-142CHKD. BY DLB DATE 7-29-81 SHEET NO. 6 OF 8Engineers • Geologists • Planners  
Environmental Specialists

DAM DATA  
TOPEL 2110.0 COGD 3.1 EXPD 1.5 DAMWID 800.

STATION 2, PLAN 1, RATIO 1

PMF  
INFLOW/OUTFLOW  
DATA

|       |       | END-OF-PERIOD HYDROGRAPH ORDINATES |       |        |         |         |        |
|-------|-------|------------------------------------|-------|--------|---------|---------|--------|
| MO.DA | HR.MM | PERIOD                             | HOURS | INFLOW | OUTFLOW | STORAGE | STAGE  |
| 1.01  | .10   | 1                                  | .17   | 5.     | 0.      | 5337.   | 2096.0 |
| 1.01  | .20   | 2                                  | .33   | 5.     | 0.      | 5337.   | 2096.0 |
| 1.01  | .30   | 3                                  | .50   | 5.     | 0.      | 5338.   | 2096.0 |
| 1.01  | .40   | 4                                  | .67   | 6.     | 0.      | 5338.   | 2096.0 |
| 1.01  | .50   | 5                                  | .83   | 6.     | 0.      | 5338.   | 2096.0 |
| 1.01  | 1.00  | 6                                  | 1.00  | 6.     | 0.      | 5338.   | 2096.0 |
| 1.01  | 1.10  | 7                                  | 1.17  | 6.     | 0.      | 5338.   | 2096.0 |
| .     | .     | .                                  | .     | .      | .       | .       | .      |
| .     | .     | .                                  | .     | .      | .       | .       | .      |
| .     | .     | .                                  | .     | .      | .       | .       | .      |
| 1.02  | 14.50 | 233                                | 38.83 | 8725.  | 2713.   | 6927.   | 2101.9 |
| 1.02  | 15.00 | 234                                | 39.00 | 9096.  | 2966.   | 7011.   | 2102.1 |
| 1.02  | 15.10 | 235                                | 39.17 | 9374.  | 3241.   | 7095.   | 2102.4 |
| 1.02  | 15.20 | 236                                | 39.33 | 9656.  | 3515.   | 7180.   | 2102.6 |
| 1.02  | 15.30 | 237                                | 39.50 | 10334. | 3799.   | 7267.   | 2102.9 |
| 1.02  | 15.40 | 238                                | 39.67 | 12690. | 4159.   | 7371.   | 2103.2 |
| 1.02  | 15.50 | 239                                | 39.83 | 16863. | 4672.   | 7514.   | 2103.6 |
| 1.02  | 16.00 | 240                                | 40.00 | 21958. | 5408.   | 7712.   | 2104.2 |
| 1.02  | 16.10 | 241                                | 40.17 | 24996. | 6354.   | 7954.   | 2105.0 |
| 1.02  | 16.20 | 242                                | 40.33 | 25160. | 7405.   | 8205.   | 2105.0 |
| 1.02  | 16.30 | 243                                | 40.50 | 23065. | 8381.   | 8428.   | 2106.4 |
| 1.02  | 16.40 | 244                                | 40.67 | 19959. | 9165.   | 8604.   | 2107.0 |
| 1.02  | 16.50 | 245                                | 40.83 | 16968. | 9745.   | 8727.   | 2107.4 |
| 1.02  | 17.00 | 246                                | 41.00 | 14770. | 10128.  | 8808.   | 2107.6 |
| 1.02  | 17.10 | 247                                | 41.17 | 13319. | 10374.  | 8860.   | 2107.8 |
| 1.02  | 17.20 | 248                                | 41.33 | 12168. | 10523.  | 8892.   | 2107.9 |
| 1.02  | 17.30 | 249                                | 41.50 | 11215. | 10597.  | 8907.   | 2107.9 |
| 1.02  | 17.40 | 250                                | 41.67 | 10382. | 10610.  | 8910.   | 2107.9 |
| 1.02  | 17.50 | 251                                | 41.83 | 9692.  | 10574.  | 8903.   | 2107.9 |
| 1.02  | 18.00 | 252                                | 42.00 | 9103.  | 10501.  | 8887.   | 2107.8 |
| 1.02  | 18.10 | 253                                | 42.17 | 8634.  | 10400.  | 8866.   | 2107.8 |
| 1.02  | 18.20 | 254                                | 42.33 | 7934.  | 10267.  | 8838.   | 2107.7 |
| 1.02  | 18.30 | 255                                | 42.50 | 6869.  | 10087.  | 8799.   | 2107.6 |
| 1.02  | 18.40 | 256                                | 42.67 | 5595.  | 9844.   | 8748.   | 2107.4 |
| 1.02  | 18.50 | 257                                | 42.83 | 4336.  | 9537.   | 8683.   | 2107.2 |
| 1.02  | 19.00 | 258                                | 43.00 | 3263.  | 9177.   | 8606.   | 2107.0 |
| 1.02  | 19.10 | 259                                | 43.17 | 2450.  | 8800.   | 8522.   | 2106.7 |
| 1.02  | 19.20 | 260                                | 43.33 | 1910.  | 8405.   | 8433.   | 2106.5 |
| 1.02  | 19.30 | 261                                | 43.50 | 1547.  | 8006.   | 8344.   | 2106.2 |
| 1.02  | 19.40 | 262                                | 43.67 | 1289.  | 7621.   | 8256.   | 2105.9 |
| 1.02  | 19.50 | 263                                | 43.83 | 1189.  | 7262.   | 8171.   | 2105.7 |
| 1.02  | 20.00 | 264                                | 44.00 | 1109.  | 6919.   | 8089.   | 2105.4 |
| 1.02  | 20.10 | 265                                | 44.17 | 1035.  | 6590.   | 8011.   | 2105.2 |
| 1.02  | 20.20 | 266                                | 44.33 | 965.   | 6283.   | 7936.   | 2104.9 |
| 1.02  | 20.30 | 267                                | 44.50 | 901.   | 6002.   | 7864.   | 2104.7 |
| 1.02  | 20.40 | 268                                | 44.67 | 840.   | 5734.   | 7795.   | 2104.5 |
| 1.02  | 20.50 | 269                                | 44.83 | 784.   | 5476.   | 7729.   | 2104.3 |
| 1.02  | 21.00 | 270                                | 45.00 | 732.   | 5229.   | 7666.   | 2104.1 |
| 1.02  | 21.10 | 271                                | 45.17 | 720.   | 5001.   | 7605.   | 2103.9 |
| 1.02  | 21.20 | 272                                | 45.33 | 712.   | 4794.   | 7548.   | 2103.7 |
| 1.02  | 21.30 | 273                                | 45.50 | 707.   | 4597.   | 7493.   | 2103.6 |

Q<sub>MAX</sub> INFLOWQ<sub>MAX</sub> OUTFLOW

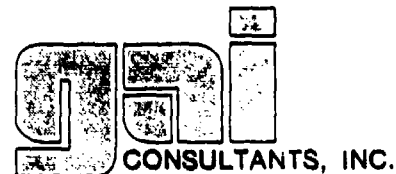
MAX. POOL LEVEL

SUBJECT DAM SAFETY INSPECTION

HERITAGE RESERVATION DAM

BY DJS DATE 7-21-81 PROJ. NO. 80-238-142

CHKD. BY DLG DATE 7-29-81 SHEET NO. 7 OF 8



Engineers • Geologists • Planners  
Environmental Specialists

### SUMMARY OUTPUT:

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS  
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)  
AREA IN SQUARE MILES (SQUARE KILOMETERS)

#### RATIOS APPLIED TO FLOWS

| OPERATION     | STATION  | AREA | PLAN RATIO | 1                             |
|---------------|----------|------|------------|-------------------------------|
|               |          |      |            | 1.00                          |
| HYDROGRAPH AT | 1        | 5.81 | 1          | 25160. ← Q <sub>MAX</sub> IN  |
|               | ( 15.05) |      | (          | 712.45)(                      |
| OUTED TO      | 2        | 5.81 | 1          | 10610. ← Q <sub>MAX</sub> OUT |
|               | ( 15.05) |      | (          | 300.43)(                      |

#### SUMMARY OF DAM SAFETY ANALYSIS

|         | ELEVATION | INITIAL VALUE | SPILLWAY CREST | TOP OF DAM |
|---------|-----------|---------------|----------------|------------|
| STORAGE |           | 2096.00       | 2196.00        | 2110.00    |
| OUTFLOW |           | 5337.         | 5337.          | 9593.      |
|         |           | 0.            | 0.             | 13993.     |

| RATIO OF PMF | MAXIMUM RESERVOIR W.S.ELEV | MAXIMUM DEPTH OVER DAM | MAXIMUM STORAGE AC-FT | MAXIMUM OUTFLOW CFS | DURATION OVER TOP HOURS | TIME OF MAX OUTFLOW HOURS | TIME OF FAILURE HOURS |
|--------------|----------------------------|------------------------|-----------------------|---------------------|-------------------------|---------------------------|-----------------------|
| 1.00         | 2107.91                    | 0.00                   | 8910.                 | 10610.              | 0.00                    | 41.67                     | 0.00                  |

(FROM "ADDENDUM DESIGN REPORT")

SUBJECT DAM SAFETY INSPECTION

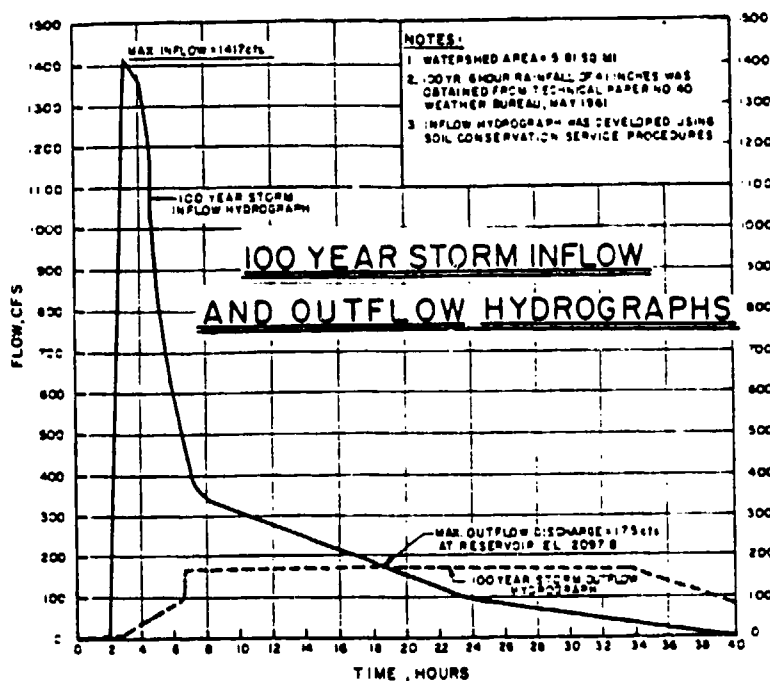
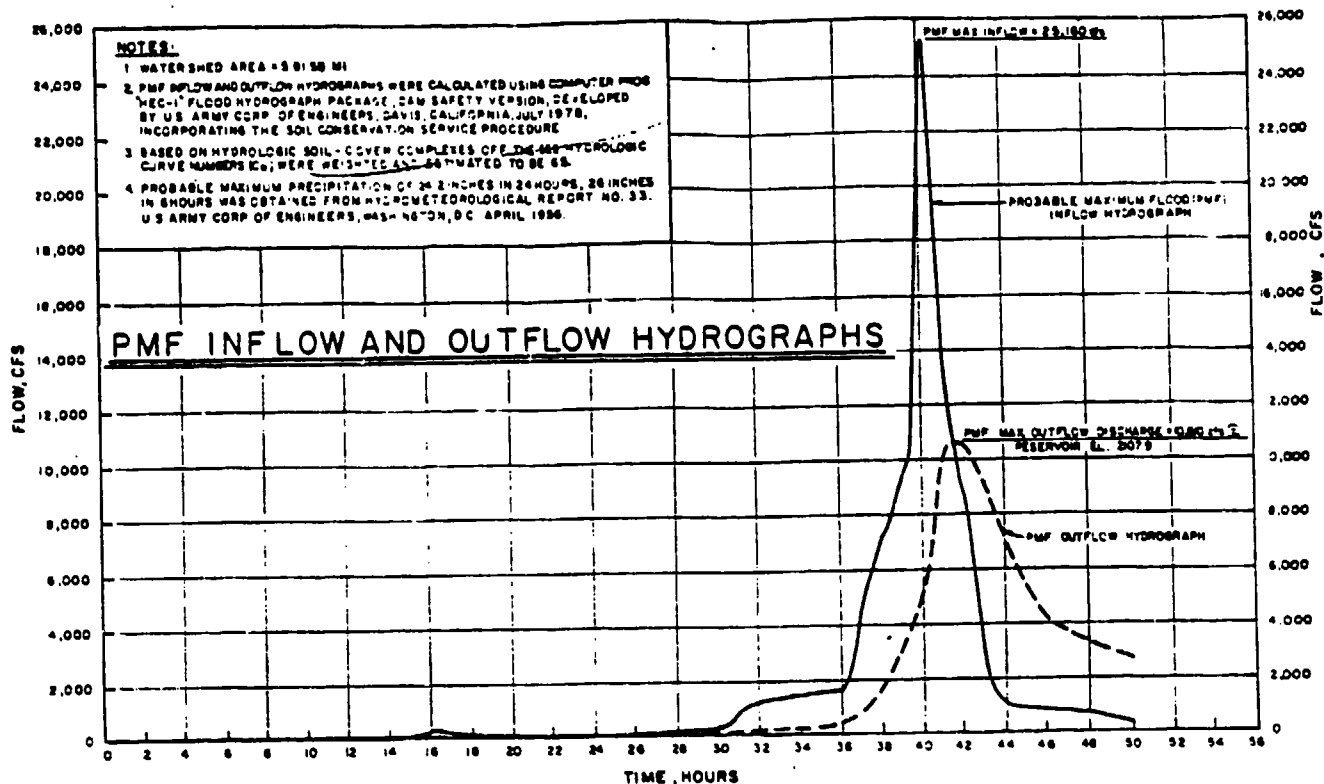
HERITAGE RESERVATION DAM

BY DJS DATE 7-21-81 PROJ. NO. 80-238-142

CHKD. BY DLB DATE 7-29-81 SHEET NO. 8 OF 8



Engineers • Geologists • Planners  
Environmental Specialists



(FROM "AS-BUILT  
REPORT")

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APPENDIX E  
FIGURES

## LIST OF FIGURES

| <u>Figure</u> | <u>Description/Title</u>                    |
|---------------|---|
| 1             | Regional Vicinity Map                       |
| 2             | Watershed Boundary Map                      |
| 3             | Plan of Dam and Emergency Spillway          |
| 4             | Plan of Dike                                |
| 5             | Dam Profile and Cross Section               |
| 6             | Profile of Emergency Spillway               |
| 7             | Dike Profile and Cross Section              |
| 8             | Service Spillway Plan and Profile           |
| 9             | Service Spillway Riser Plan and Arrangement |
| 10            | Plan of Emergency Evacuation Measures       |

BRANDONVILLE, W. VA.—PA.  
 NE 4 BRUCETON 15 QUADRANGLE  
 N3937.5—W7930/7.5  
 1958  
 PHOTO REVISÉ 1974  
 AMS 5063 II NE—SERIES V854



HERITAGE RESERVATION DAM

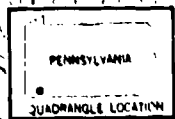
Dike

STATE FOREST LAND  
 APPROX

STATE FOREST LAND  
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W H A R T O N

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET



FORT NECESSITY, PA.  
 N3945—W7930/7.5  
 1964  
 PHOTO REVISÉ 1974  
 AMS 5063 I SE—SERIES V831

FIGURE 1  
 REGIONAL VICINITY MAP



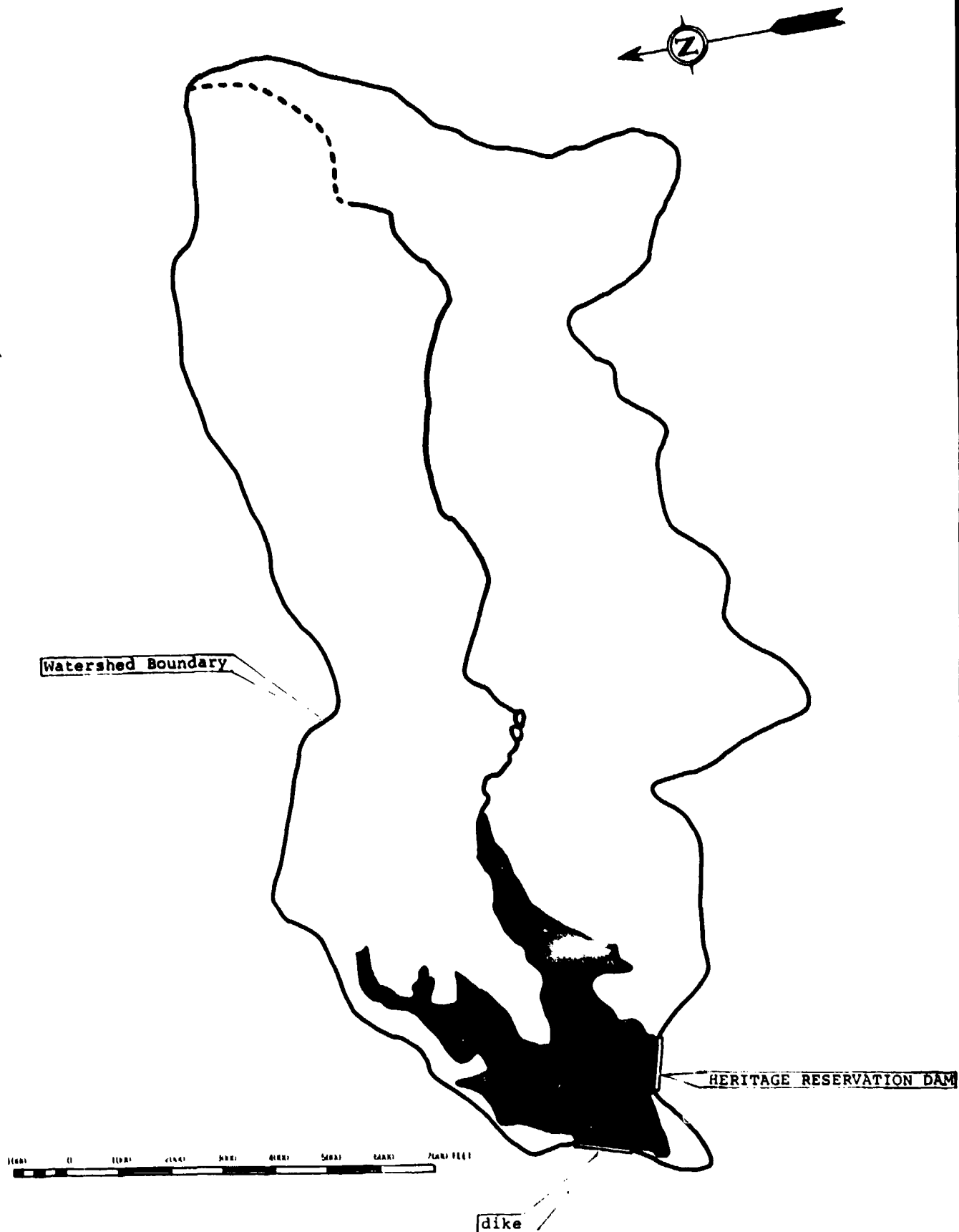
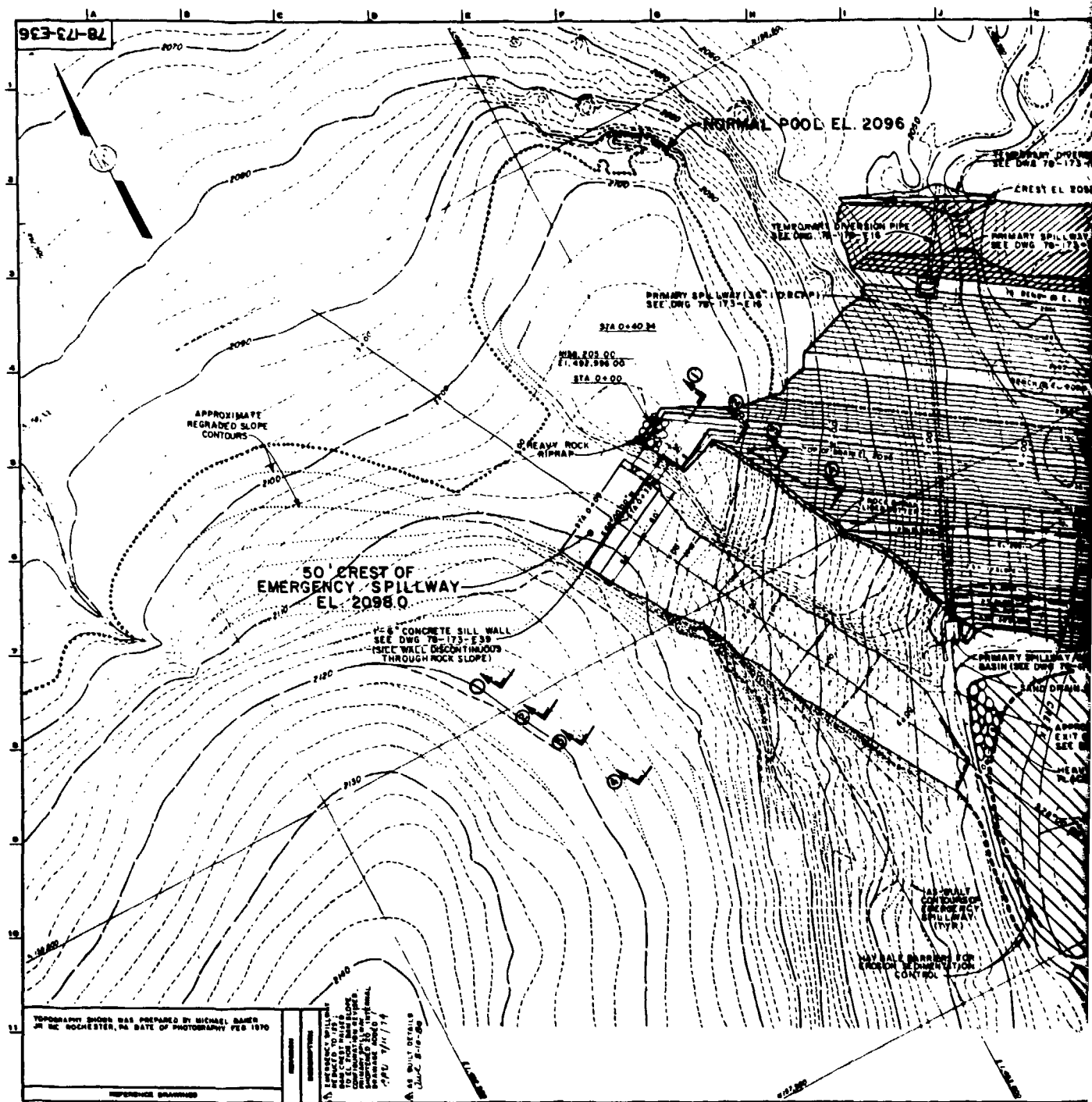
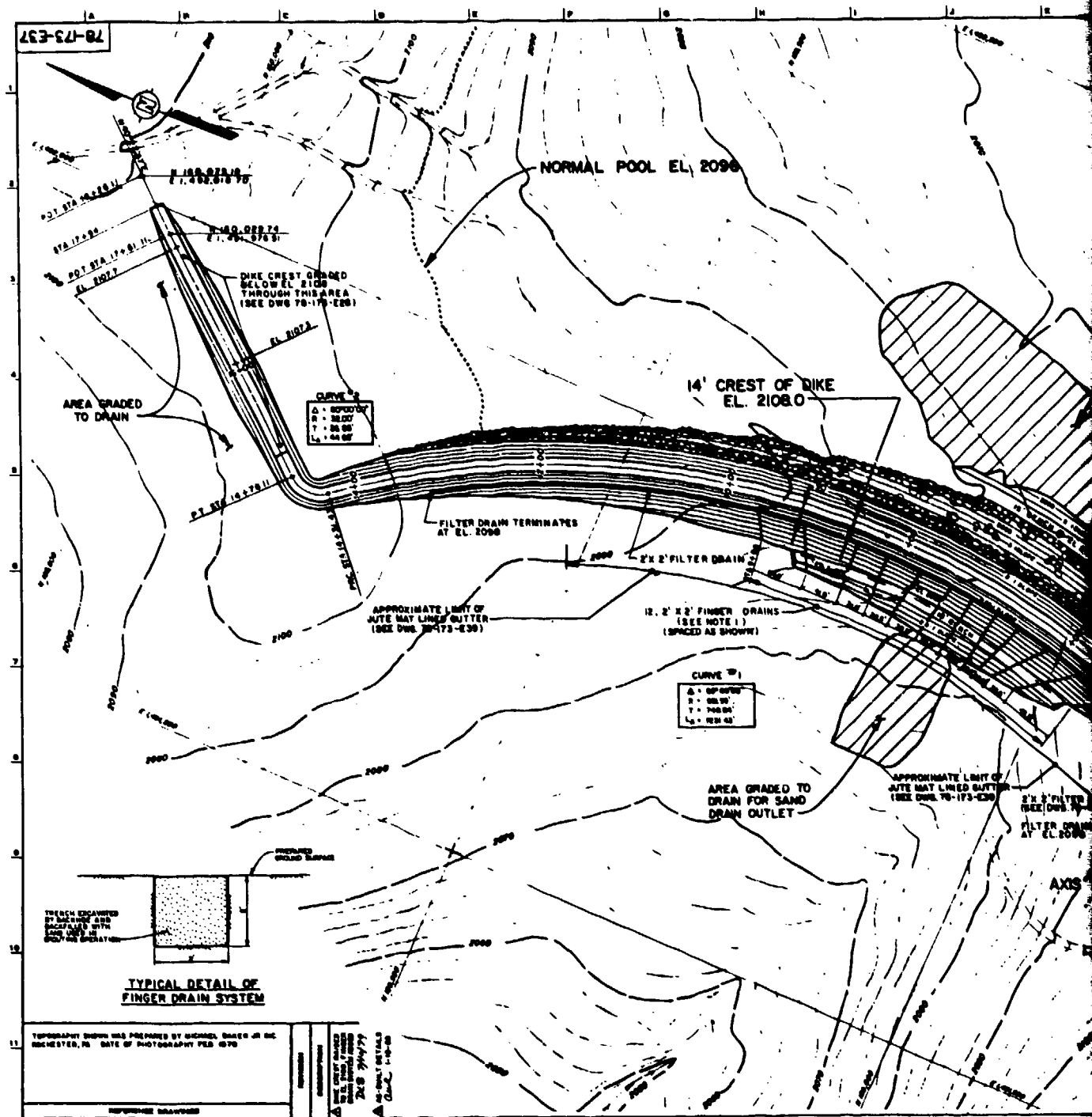
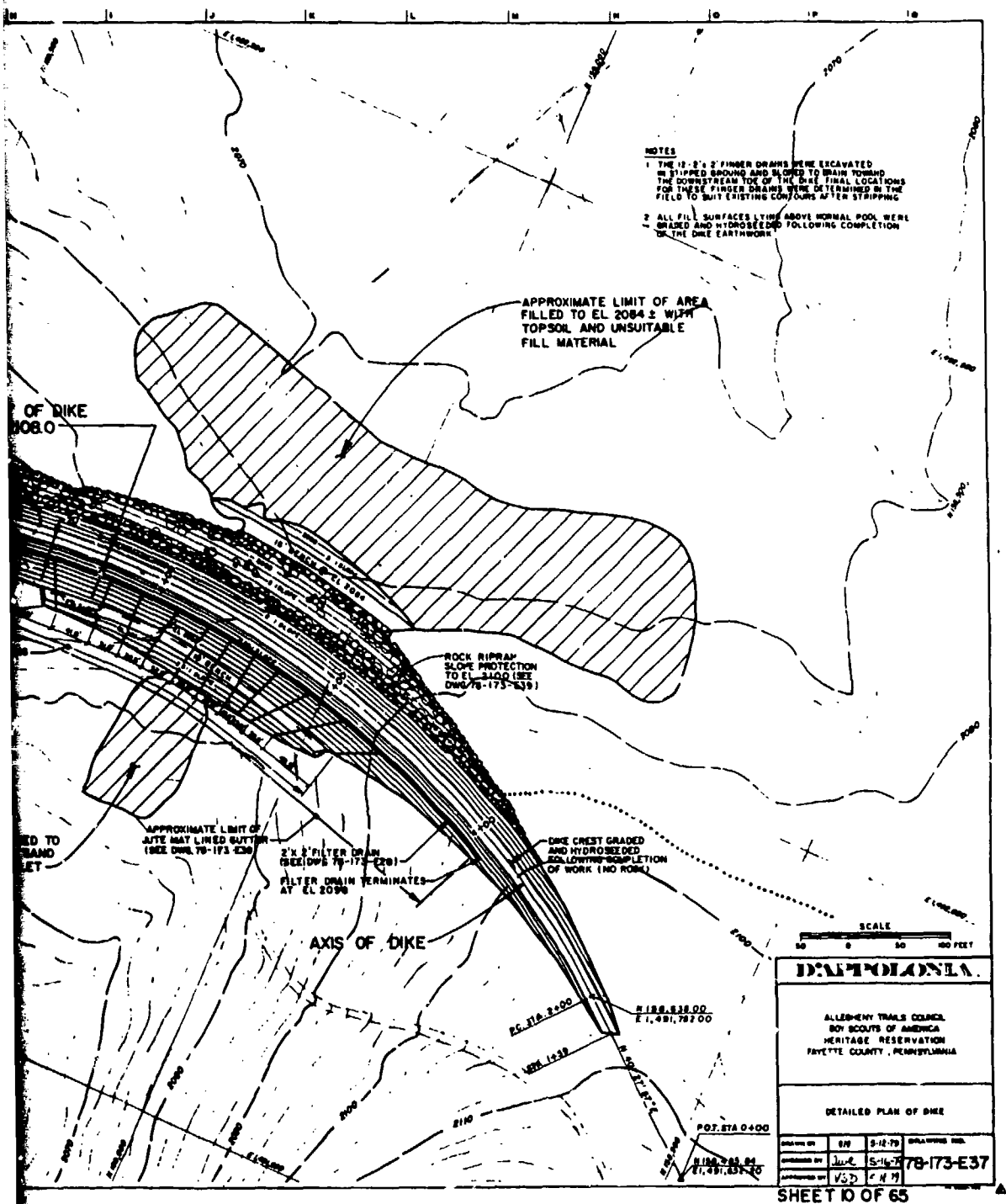


FIGURE 2  
WATERSHED BOUNDARY MAP

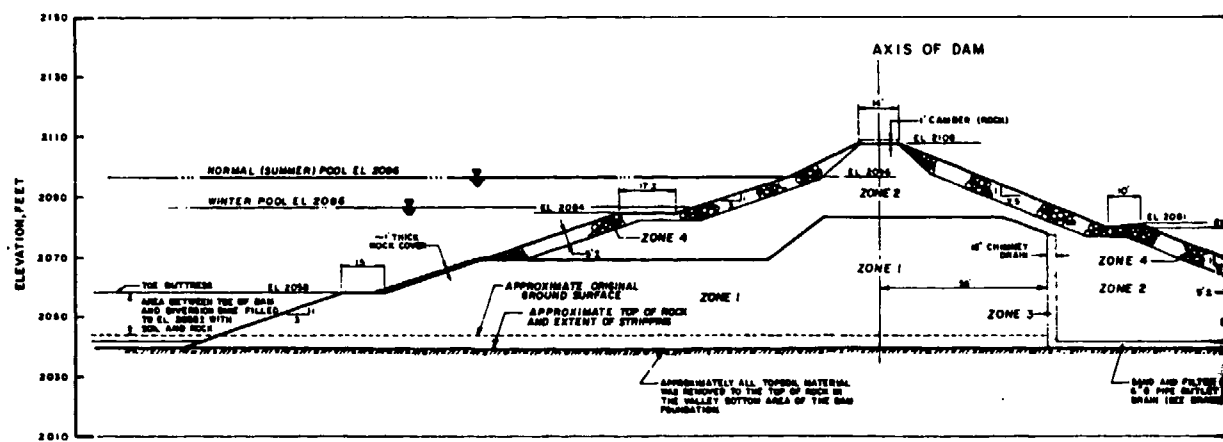
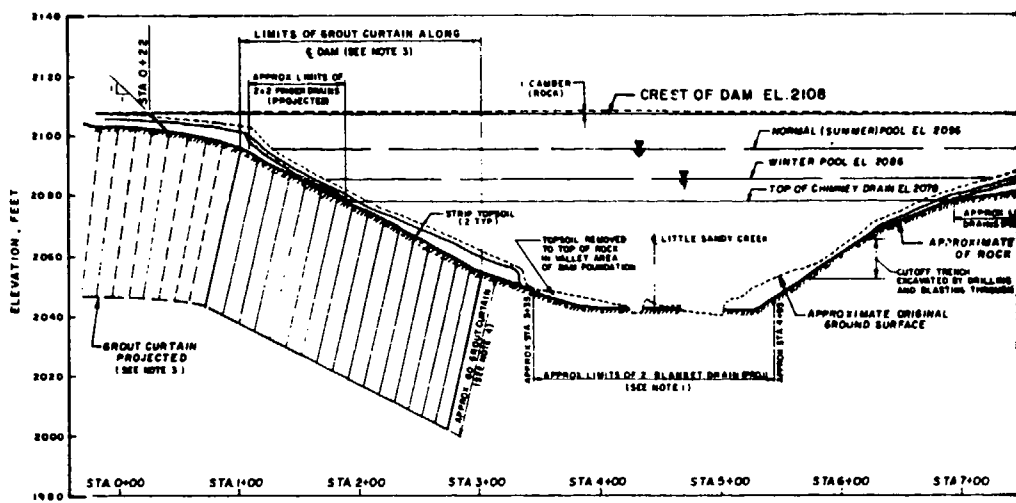






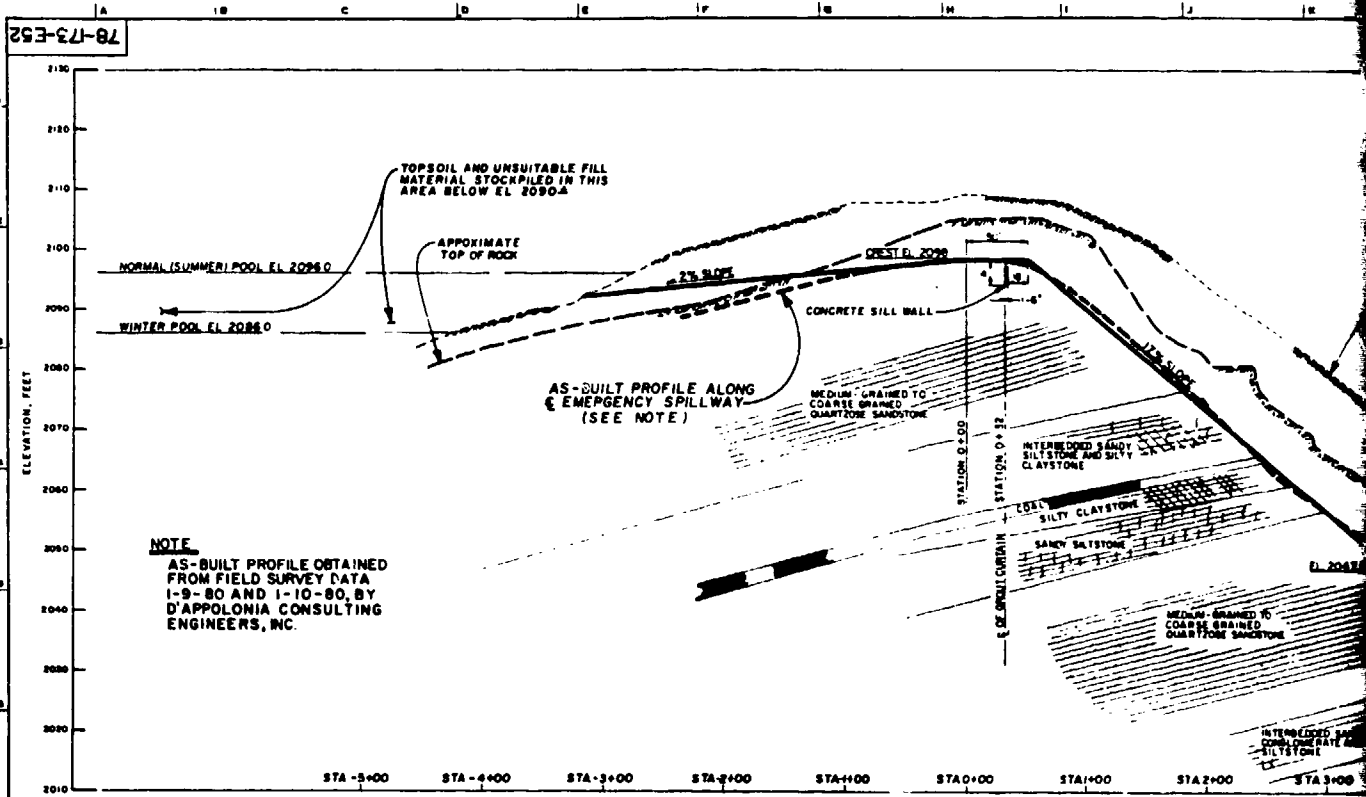


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| REVISION | DATE    | BY          | CHKD        |
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| 63       | 10/1/78 | J. L. BROWN | J. L. BROWN |
| 64       | 10/1/78 | J. L. BROWN | J. L. BROWN |
| 65       | 10/1/78 | J. L. BROWN | J. L. BROWN |
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| 73       | 10/1/78 | J. L. BROWN | J. L. BROWN |
| 74       | 10/1/78 | J. L. BROWN | J. L. BROWN |
| 75       | 10/1/78 | J. L. BROWN | J. L. BROWN |
| 76       | 10/1/78 | J. L. BROWN | J. L. BROWN |
| 77       | 10/1/78 | J. L. BROWN | J. L. BROWN |
| 78       | 10/1/78 | J. L. BROWN | J. L. BROWN |
| 79       | 10/1/78 | J. L. BROWN | J. L. BROWN |
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| 89       | 10/1/78 | J. L. BROWN | J. L. BROWN |
| 90       | 10/1/78 | J. L. BROWN | J. L. BROWN |
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| 92       | 10/1/78 | J. L. BROWN | J. L. BROWN |
| 93       | 10/1/78 | J. L. BROWN | J. L. BROWN |
| 94       | 10/1/78 | J. L. BROWN | J. L. BROWN |
| 95       | 10/1/78 | J. L. BROWN | J. L. BROWN |
| 96       | 10/1/78 | J. L. BROWN | J. L. BROWN |
| 97       | 10/1/78 | J. L. BROWN | J. L. BROWN |
| 98       | 10/1/78 | J. L. BROWN | J. L. BROWN |
| 99       | 10/1/78 | J. L. BROWN | J. L. BROWN |
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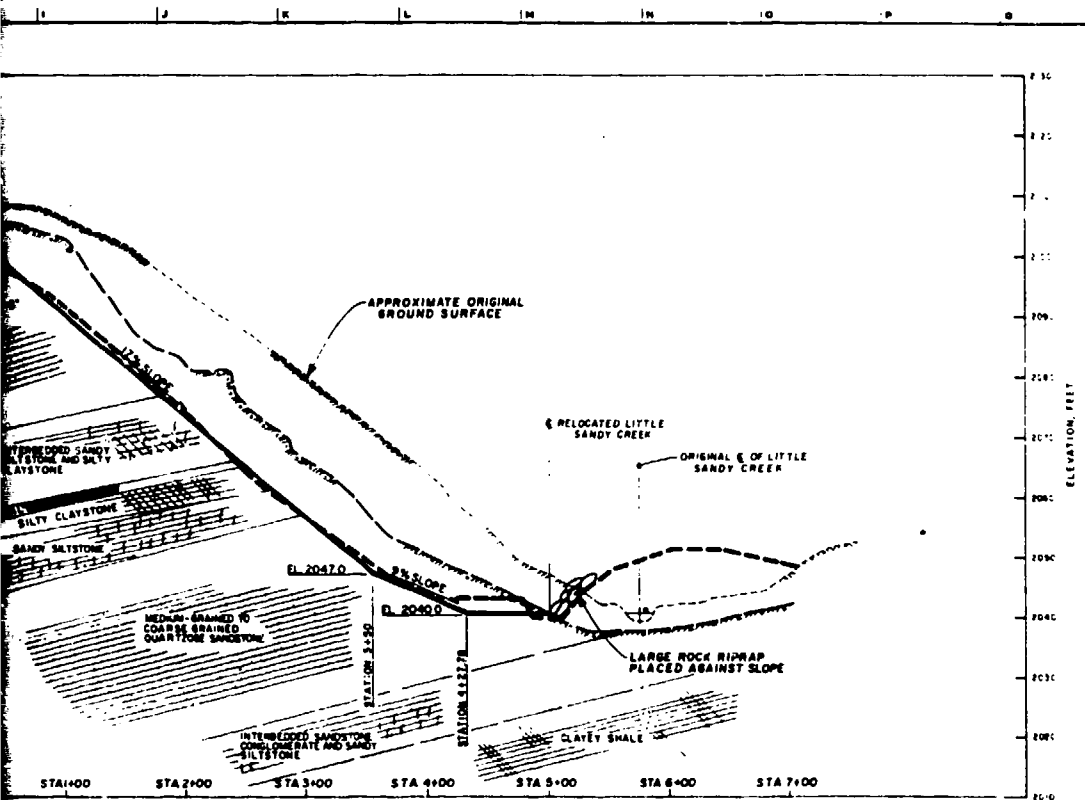


PROFILE ALONG C OF EMERGENCY SPILLWAY



|           |         |          |          |
|-----------|---------|----------|----------|
| REVISIONS | DATE    | BY       | APP      |
| 1         | 10/1/80 | J. J. J. | J. J. J. |
| 2         | 10/1/80 | J. J. J. | J. J. J. |
| 3         | 10/1/80 | J. J. J. | J. J. J. |
| 4         | 10/1/80 | J. J. J. | J. J. J. |
| 5         | 10/1/80 | J. J. J. | J. J. J. |
| 6         | 10/1/80 | J. J. J. | J. J. J. |
| 7         | 10/1/80 | J. J. J. | J. J. J. |
| 8         | 10/1/80 | J. J. J. | J. J. J. |
| 9         | 10/1/80 | J. J. J. | J. J. J. |
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| 11        | 10/1/80 | J. J. J. | J. J. J. |

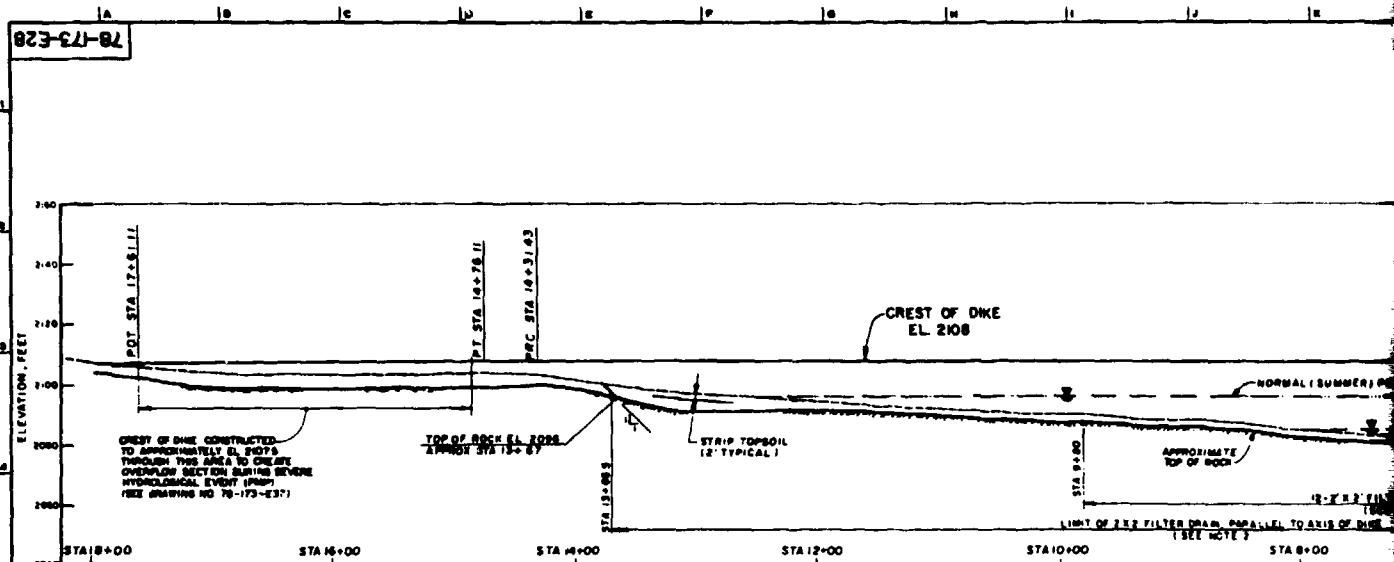




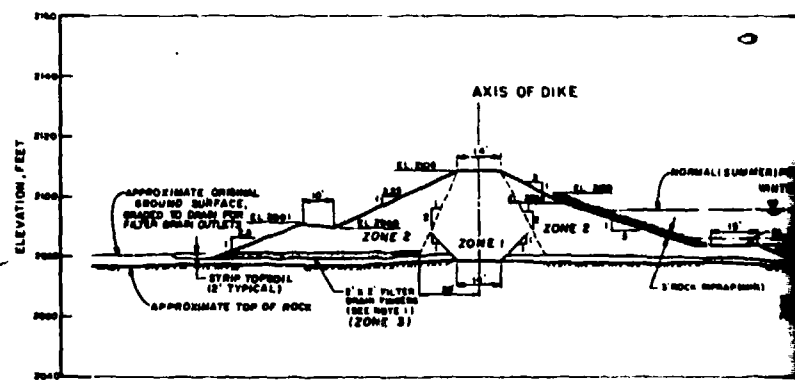
**EMERGENCY SPILLWAY**  
 HORIZONTAL SCALE (LOOKING NORTHEAST)  
 0 50 100 FEET

**NOTE**  
 FOR AS-BUILT SURVEY SECTIONS OF  
 EMERGENCY SPILLWAY, SEE DRAWINGS  
 78-173-ETB

|   |          |             |            |
|---|----------|-------------|------------|
| <b>DAIYOLAN</b>   |          |             |            |
| ALLEGANY COUNTY<br>BOY SCOUTS OF AMERICA<br>HERITAGE PRESERVATION<br>ALLEGANY COUNTY, WEST VIRGINIA |          |             |            |
| PROFILE - EMERGENCY SPILLWAY  |          |             |            |
| DESIGNED BY   | W. B. L. | DATE        | 8-17-78    |
| CONSTRUCTED BY  | W. B. L. | PROJECT NO. | 78-173-E52 |
| SHEET 2 OF 65   |          |             |            |



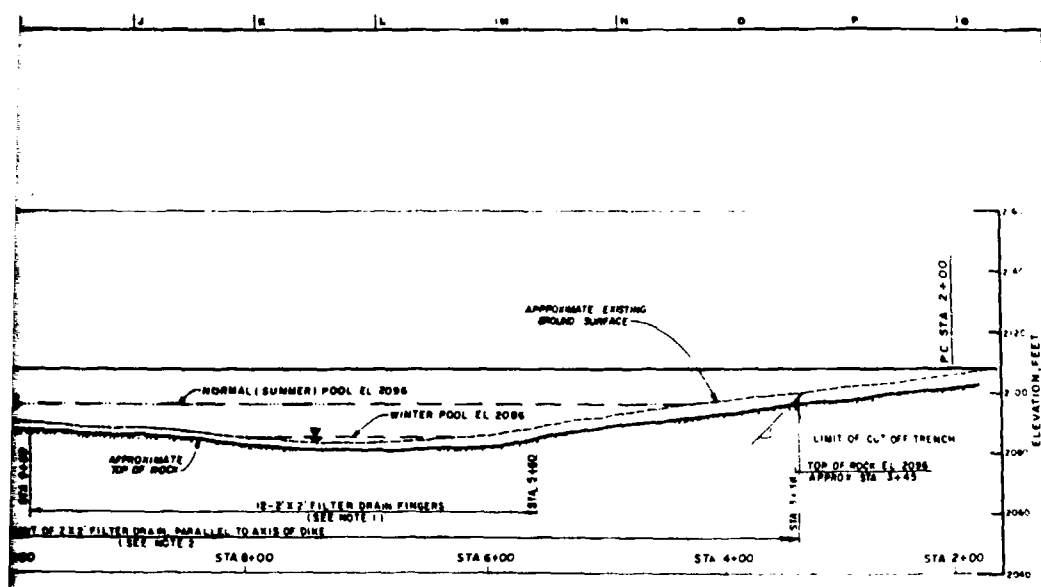
PROFILE AT CENTERLINE OF DIKE



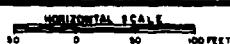
TYPICAL SECTION THROUGH DIKE



|                    |             |
|--------------------|-------------|
| REFERENCE DRAWINGS | 78-173-E28  |
| 78-173-E29         | 78-173-E30  |
| 78-173-E31         | 78-173-E32  |
| 78-173-E33         | 78-173-E34  |
| 78-173-E35         | 78-173-E36  |
| 78-173-E37         | 78-173-E38  |
| 78-173-E39         | 78-173-E40  |
| 78-173-E41         | 78-173-E42  |
| 78-173-E43         | 78-173-E44  |
| 78-173-E45         | 78-173-E46  |
| 78-173-E47         | 78-173-E48  |
| 78-173-E49         | 78-173-E50  |
| 78-173-E51         | 78-173-E52  |
| 78-173-E53         | 78-173-E54  |
| 78-173-E55         | 78-173-E56  |
| 78-173-E57         | 78-173-E58  |
| 78-173-E59         | 78-173-E60  |
| 78-173-E61         | 78-173-E62  |
| 78-173-E63         | 78-173-E64  |
| 78-173-E65         | 78-173-E66  |
| 78-173-E67         | 78-173-E68  |
| 78-173-E69         | 78-173-E70  |
| 78-173-E71         | 78-173-E72  |
| 78-173-E73         | 78-173-E74  |
| 78-173-E75         | 78-173-E76  |
| 78-173-E77         | 78-173-E78  |
| 78-173-E79         | 78-173-E80  |
| 78-173-E81         | 78-173-E82  |
| 78-173-E83         | 78-173-E84  |
| 78-173-E85         | 78-173-E86  |
| 78-173-E87         | 78-173-E88  |
| 78-173-E89         | 78-173-E90  |
| 78-173-E91         | 78-173-E92  |
| 78-173-E93         | 78-173-E94  |
| 78-173-E95         | 78-173-E96  |
| 78-173-E97         | 78-173-E98  |
| 78-173-E99         | 78-173-E100 |



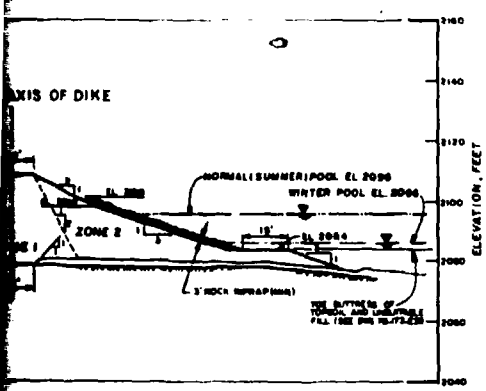
**CENTERLINE OF DIKE**



- ZONE 1 - SELECT MATERIALS FROM BORROW AREA
- ZONE 2 - COMMON EXCAVATION MATERIALS
- ZONE 3 - DRAIN MATERIAL

**NOTES**

1. THE 12" X 2' FINGER DRAINS WERE EXCAVATED IN STRIPPED GROUND FOR PLAN AND ARRANGEMENT SEE DWG 78-173-E27
2. 2' X 2' FILTER DRAIN PARALLEL TO DIKE AXIS WAS EXCAVATED IN STRIPPED GROUND AND WAS CATCHED UP THE ADJUSTMENTS TO EL. 2086 SEE DWG 78-173-E27 FOR PLAN AND ARRANGEMENT



**THROUGH DIKE**



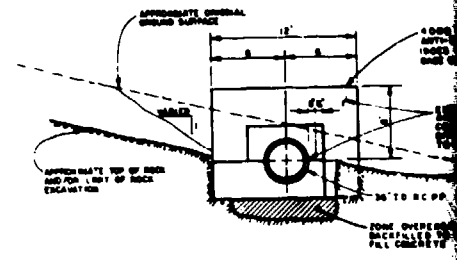
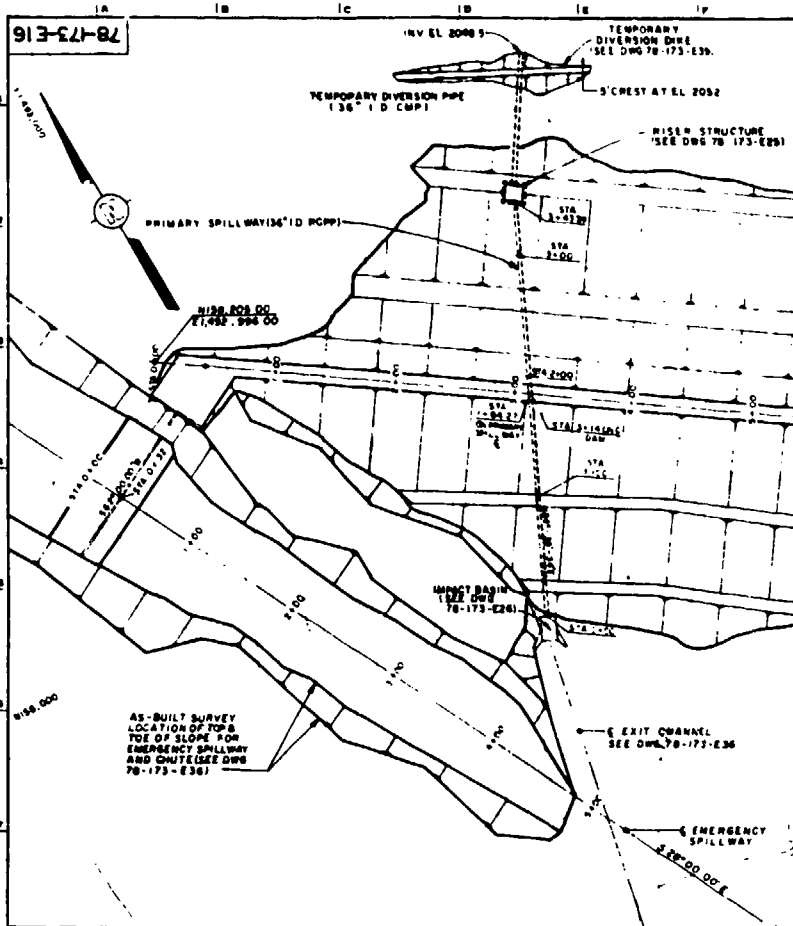
**DATOLONIA**

ALLEGANY TRAILS COUNCIL  
BOY SCOUTS OF AMERICA  
HERITAGE RESERVATION  
PRYETTE COUNTY, PENNSYLVANIA

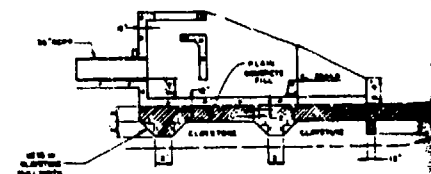
PROFILE AT CENTERLINE OF DIKE  
AND TYPICAL SECTION

|             |      |        |            |
|-------------|------|--------|------------|
| DESIGNED BY | ACS  | 3-9-79 | DRAWN BY   |
| CHECKED BY  | S.B. | 5/2/79 | 78-173-E28 |
| APPROVED BY | J.D. | 5-1    |            |

SHEET 14 OF 65

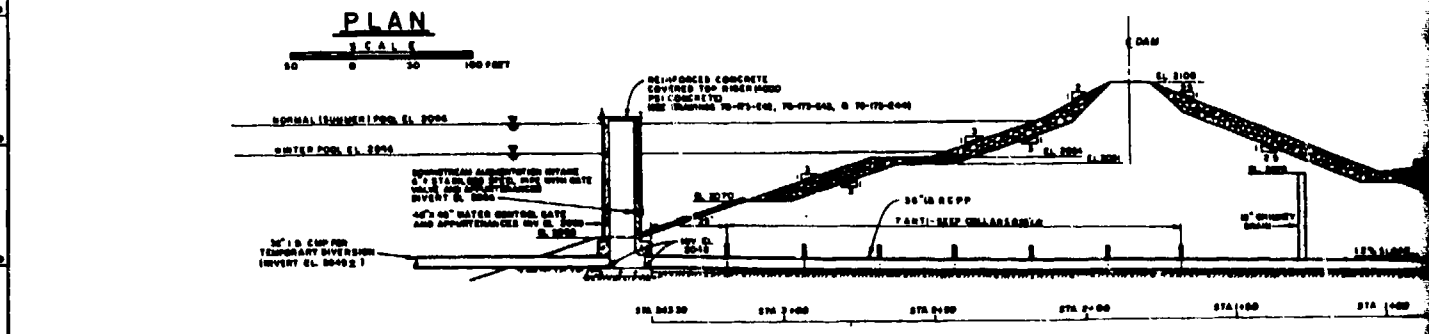


**TYPICAL SECTION — PRIMARY SPILLWAY**  
 SCALE: 1" = 10' HORIZONTAL, 1" = 10' VERTICAL



**ENLARGED DETAIL  
 IMPACT BASIN**  
 NTS

(FOR DETAILS SEE DRAWINGS 78-173-E40, 78-173-E41 & 78-173-E42)

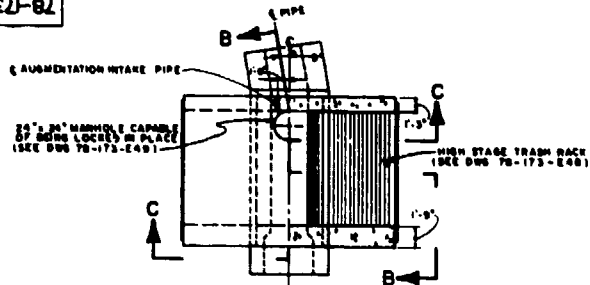


**PROFILE ALONG CENTERLINE OF PRIMARY SPILLWAY**  
 SCALE: 1" = 40' HORIZONTAL, 1" = 10' VERTICAL

| REFERENCE DRAWINGS |         |
|--------------------|---------|
| 78-173-E36         | PLAN    |
| 78-173-E37         | SECTION |
| 78-173-E38         | SECTION |
| 78-173-E39         | SECTION |
| 78-173-E40         | SECTION |
| 78-173-E41         | SECTION |
| 78-173-E42         | SECTION |
| 78-173-E43         | SECTION |
| 78-173-E44         | SECTION |
| 78-173-E45         | SECTION |
| 78-173-E46         | SECTION |
| 78-173-E47         | SECTION |
| 78-173-E48         | SECTION |
| 78-173-E49         | SECTION |
| 78-173-E50         | SECTION |
| 78-173-E51         | SECTION |
| 78-173-E52         | SECTION |
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| 78-173-E59         | SECTION |
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| 78-173-E61         | SECTION |
| 78-173-E62         | SECTION |
| 78-173-E63         | SECTION |
| 78-173-E64         | SECTION |
| 78-173-E65         | SECTION |
| 78-173-E66         | SECTION |
| 78-173-E67         | SECTION |
| 78-173-E68         | SECTION |
| 78-173-E69         | SECTION |
| 78-173-E70         | SECTION |
| 78-173-E71         | SECTION |
| 78-173-E72         | SECTION |
| 78-173-E73         | SECTION |
| 78-173-E74         | SECTION |
| 78-173-E75         | SECTION |
| 78-173-E76         | SECTION |
| 78-173-E77         | SECTION |
| 78-173-E78         | SECTION |
| 78-173-E79         | SECTION |
| 78-173-E80         | SECTION |
| 78-173-E81         | SECTION |
| 78-173-E82         | SECTION |
| 78-173-E83         | SECTION |
| 78-173-E84         | SECTION |
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| 78-173-E88         | SECTION |
| 78-173-E89         | SECTION |
| 78-173-E90         | SECTION |
| 78-173-E91         | SECTION |
| 78-173-E92         | SECTION |
| 78-173-E93         | SECTION |
| 78-173-E94         | SECTION |
| 78-173-E95         | SECTION |
| 78-173-E96         | SECTION |
| 78-173-E97         | SECTION |
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| 78-173-E99         | SECTION |
| 78-173-E100        | SECTION |

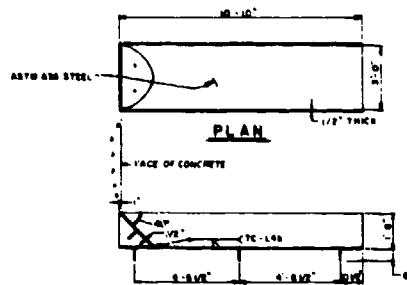


78-73-229



SECTION A-A

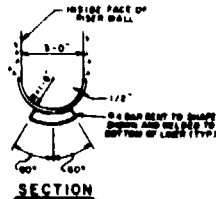
NOTE FOOTING AND SPUD WALL FITTING NOT SHOWN



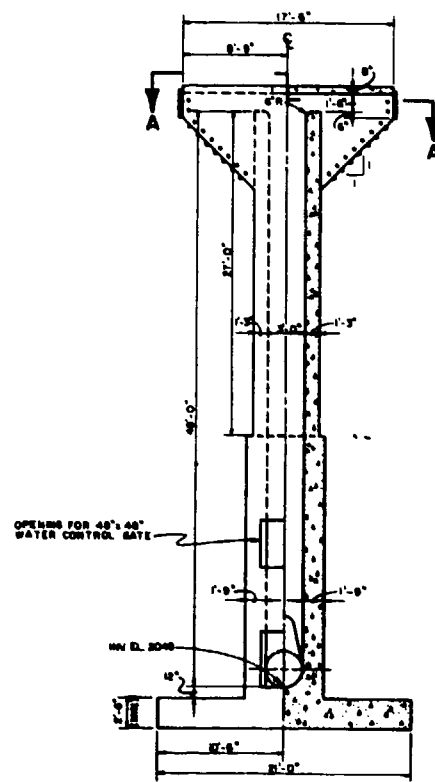
ELEVATION

SCALE 3/8\"/>

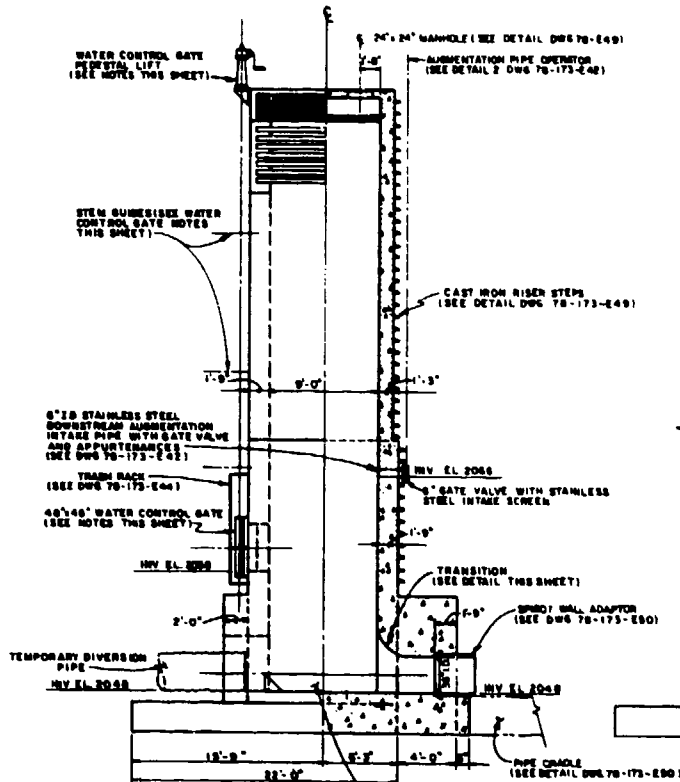
DETAIL - FABRICATED STEEL LINER PLATE



SECTION



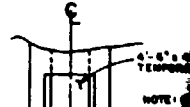
SECTION C-C



SECTION B-B

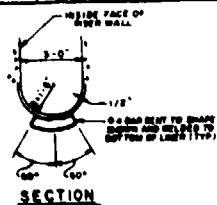
ELEVATION D-D

PLATE CONSTRUCTION



NOTE

REVISIONS  
 1. AS NOTED  
 2. AS NOTED  
 3. AS NOTED  
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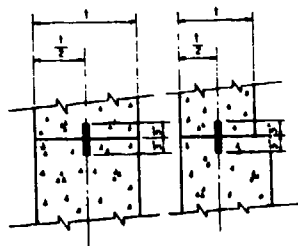


#### WATER CONTROL GATE NOTES

1. 48" x 48" ANCO MODEL 55 20 HEAVY DUTY SLUICE GATE
2. "F" TYPE WALL THIMBLE 12" DEEP, 48" x 48" SQUARE OPENING
3. CRANK OPERATED ENCLOSED GEAR PEDESTAL, LIFT ANCO MODEL CR-12 1/2" W/ 10-10 WALL BRACKET, W/ BRONZE LIFT BUT
4. 4-STEM GUIDES, TYPE 1A SPACED EVENLY AT 78" C/P AND 24" @ STAINLESS STEEL AND CARBON STEEL RISING STEM
5. GATE SHALL BE INSTALLED ACCORDING TO MANUFACTURERS RECOMMENDATIONS
6. DISTANCE FROM C/P OF GATE TO TOP OF SLAB = 36" ±

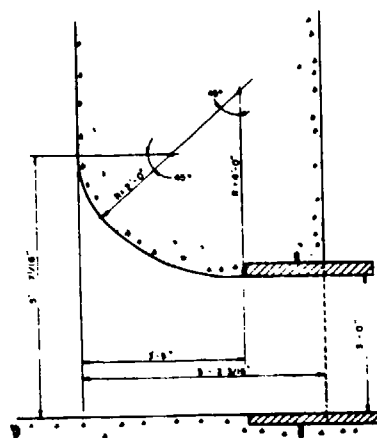
#### LINER PLATE

SEE 78-173-E401  
78-173-E401



1/4" (MIN) 1/4" GALVANIZED STEEL PLATE TO BE CONTINUOUS AROUND RISER TO BE EITHER BUTT WELDED, LAPPED AND FILED WELDED, OR LAPPED AND BOLTED AT ALL JOINTS (SPLICES)

#### PLATE CONSTRUCTION JOINT DETAIL (TYP.)

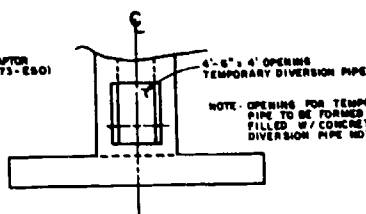


#### TRANSITION DETAIL - SECTION ON CL PIPE AT RISER DISCHARGE

SCALE  
0 2 FEET

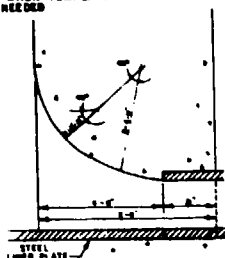
STAINLESS

SEE 78-173-E501  
78-173-E501



NOTE: OPENING FOR TEMPORARY DIVERSION PIPE TO BE FORMED INSIDE INLET AND FILLED W/ CONCRETE WHEN TEMPORARY DIVERSION PIPE NOT NEEDED

#### ELEVATION D-D



#### TRANSITION DETAIL - SECTION 9" OFF CL PIPE AT RISER DISCHARGE

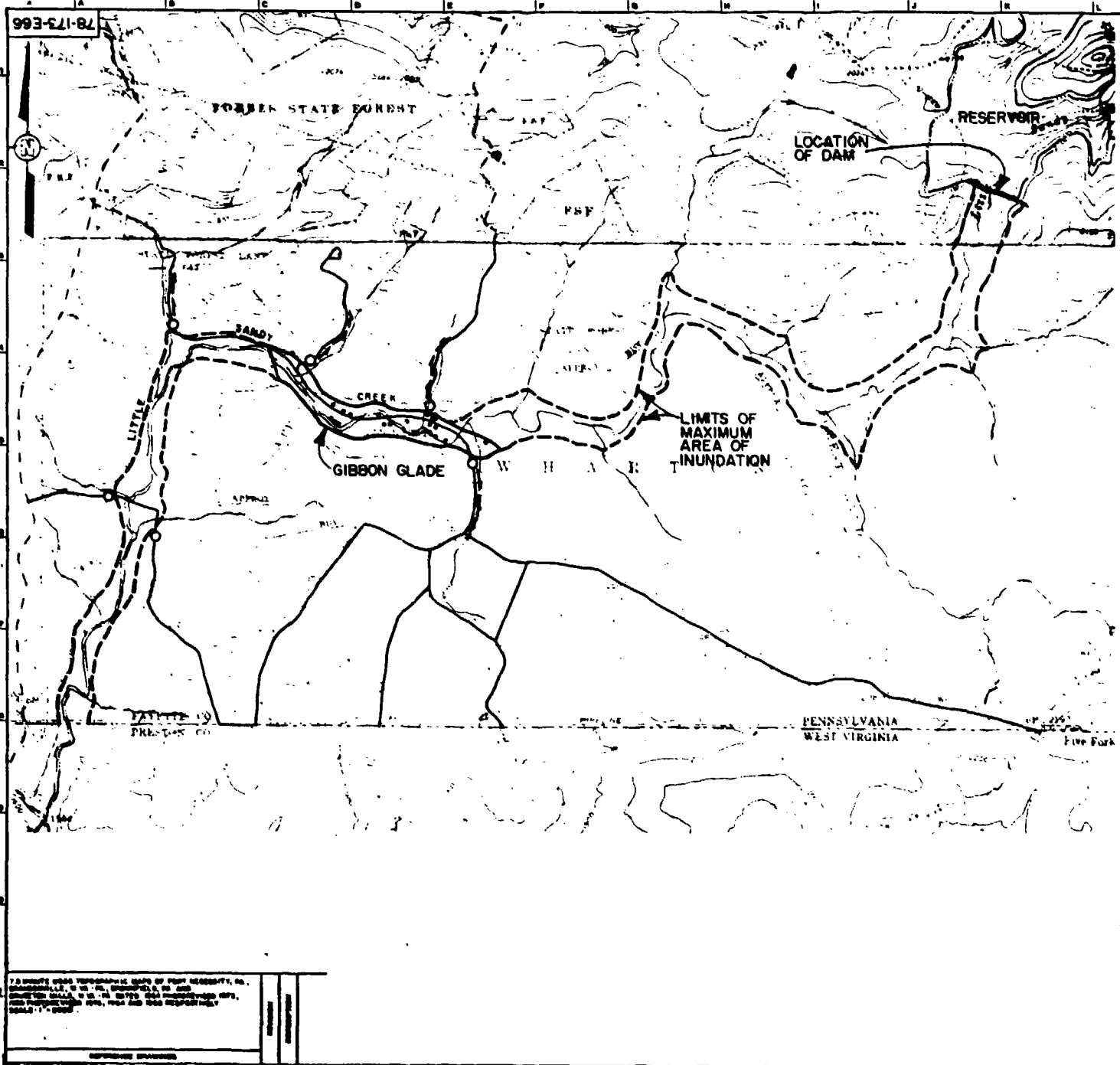
#### DAKOTA

ALLIANCE TRAILS COUNCIL  
BOY SCOUTS OF AMERICA  
HERITAGE RESERVATION  
FAYETTE COUNTY, PENNSYLVANIA

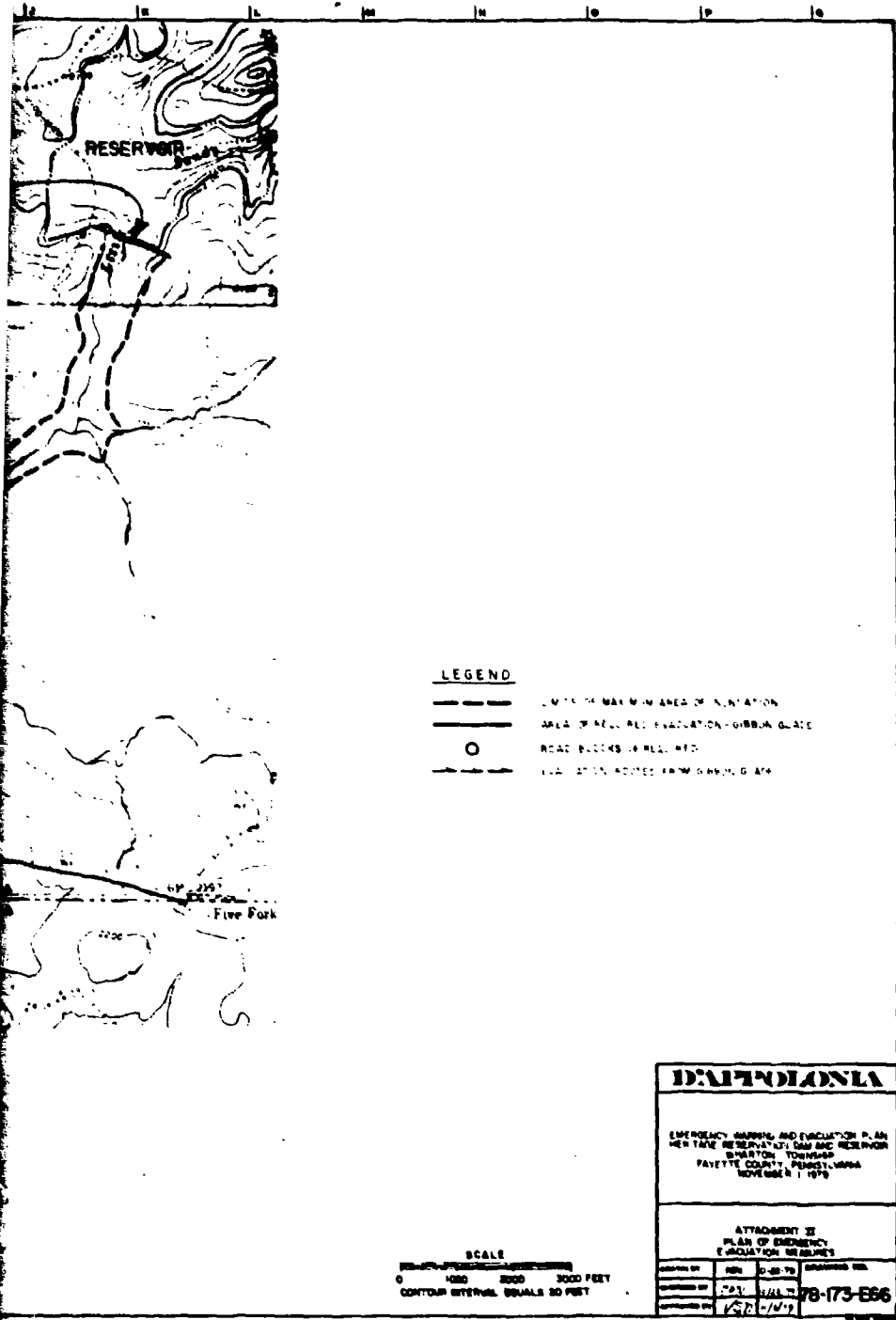
PRIMARY SPILLWAY  
RISER PLAN AND ARRANGEMENT

|              |         |            |
|--------------|---------|------------|
| DESIGNED BY  | DATE    | DRAWN BY   |
| APPROVED BY  | 1/28/78 | 78-173-E25 |
| REVISIONS BY | 1/28/78 | 2/2/78     |

SHEET 17 OF 65







APPENDIX F

GEOLOGY

## Geology

Heritage Reservation Dam is located in the Allegheny Mountain section of the Appalachian Plateau physiographic province and lies about 4 miles south of Farmington, Pennsylvania. The site is situated between 2 of the major northeast to southwest trending anticlines typical of the section, Chestnut Ridge to the west and Laurel Hill to the east. More specifically, the site is located on the western flank of the Laurel Hill Anticline. Strata exposed along the crest of Laurel Hill are generally Devonian and Mississippian in age, whereas along the flanks of Laurel Hill, the strata are generally Mississippian and Pennsylvanian in age. In the vicinity of the dam and reservoir, hilltops and upper valley walls commonly contain strata of the Conemaugh Group, whereas the lower valley walls and valley floors are underlain with strata of the Allegheny Group, which are middle to lower Pennsylvanian age, respectively.

The Laurel Hill Anticline has a strike of approximately N30°E locally. Strata underlying the steeper flank of this structure have a maximum dip of approximately 12 to 15 degrees to the northwest.

Because the folds in this area are asymmetrical in nature, the rock strata along the western boundary of the site have a strike of about N35°E and a dip of about 3 percent (1.5-2.0°) to the northwest; whereas along the eastern side of the site the rock strata strike at about N52°E and dip at approximately 0.6 percent (0.5 degree) to the northwest.

The following discussion regarding rock fracturing, groundwater, topography and surface soils in the immediate vicinity of the dam has been taken from D'Appolonia's "Design Report".

"In addition to the gentle folding, the limited amount of stress to which the rocks have been subjected has resulted in fracture zones constituting permeable conduits for groundwater movement. The fracture zones are generally oriented N2°W, N78°E, and N50°W, and are nearly vertical.

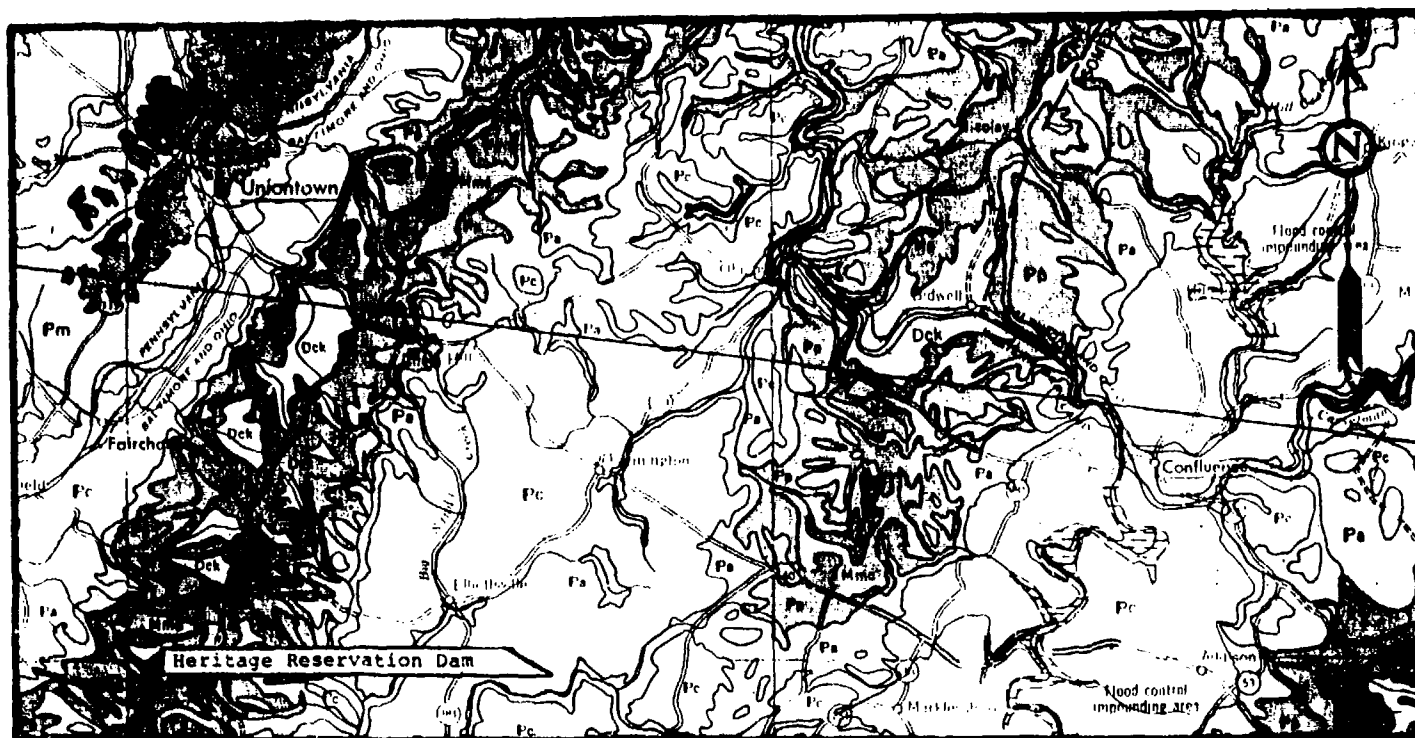
The site topography in the vicinity of the proposed dam consists of asymmetrical valleys with the west slopes being steep and the east slopes being gently. This topography is a direct result of the past uplifting and folding of bedrock and subsequent erosion and dissection by rainfall runoff. The surface slopes vary from 0.25 to 0.50 percent along the valley floor to approximately 60 percent along the hillsides.

The soils of this upland area have been formed from weathering of the bedrock materials which include sandstone, siltstone and shale. The thickness of the soil overburden varies from as little as 2 to 3 feet to as much as 6 to 8 feet with the thin overburden typically overlying the sandstones and the thicker overburden generally overlying the shales. The soils are generally residual silts and

clays of low plasticity and are often sandy and contain rock fragments, depending upon the parent rock stratum from which they have been weathered. Clay content generally ranges from approximately 10 to 30 percent by weight and can be as high as approximately 50 percent in isolated areas. The silt content of the soils typically ranges from approximately 18 to 40 percent by weight; the sand content generally ranges from 20 to 50 percent by weight; and the gravel content generally ranges from about 1 to 5 percent by weight. Natural water contents are typically between 12 and 18 percent, but can be higher in isolated areas. A more detailed discussion of the on-site soils and subsurface conditions at the dam site are presented in Section 4.0."

#### References:

1. D'Appolonia Consulting Engineers, Inc., "Design Report, Proposed Dam and Reservoir", Heritage Reservation, Wharton Twp., Fayette County, PA., May 1979.
2. Hickok IV, W.O. and F.T. Moyer, Geology & Mineral Resources of Fayette County, Pennsylvania, Pennsylvania Geologic Survey, Fourth Series, Bul. C-26, Harrisburg, 1940.



## LEGEND

### PERMIAN AND PENNSYLVANIAN



#### Washington Formation

Cyclic sequences of sandstone, shale, limestone and coal; some red shale, some mineable coal; base at the top of the Waynesburg Coal.

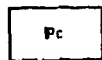
### PENNSYLVANIAN

#### APPALACHIAN PLATEAU



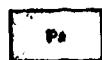
#### Monongahela Formation

Cyclic sequences of sandstone, shale, limestone and coal; limestone prominent in northern outcrop areas; shale and sandstone increase southward; commercial coals present; base at the bottom of the Pittsburgh Coal.



#### Conemaugh Formation

Cyclic sequences of red and gray shales and siltstones with thin limestones and coals; massive Mahoning Sandstone commonly present at base; Ames Limestone present in middle of section; Brush Creek Limestone in lower part of section.



#### Allegheny Group

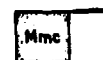
Cyclic sequences of sandstone, shale, limestone and coal; numerous commercial coals; limestones thicken westward; Vansport Limestone in lower part of section; includes Freeport, Kittanning, and Clarion Formations.



#### Pottsville Group

Predominantly sandstones and conglomerates with thin shales and coals; some coals mineable locally.

### MISSISSIPPIAN



#### Mauch Chunk Formation

Red shales with brown to greenish gray flaggy sandstones, includes Greenbrier Limestone in Fayette, Westmoreland, and Somerset counties; Logan Limestone at the base in southwestern Pennsylvania.



#### Pocono Group

Predominantly gray, hard, massive, cross-bedded conglomerate and sandstone with some shale, includes in the Appalachian Plateau: Berghoon, Shenango, Cayahoga, Cussewago, Corry, and Kopp Formations; includes part of "Onondaga" of M. L. Fuller in Potter and Tioga counties.

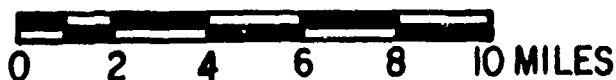
### DEVONIAN



#### Catskill Formation

Chiefly red to brownish shales and sandstones, includes gray and greenish sandstone tongues named Elk Mountain, Honesdale, Shohola, and Delaware River in the east.

### Scale



### REFERENCE:

GEOLOGIC MAP OF PENNSYLVANIA PREPARED BY COMMONWEALTH OF PENNA. DEPT. OF INTERNAL AFFAIRS, DATED 1960, SCALE 1" = 4 MILES

### GEOLOGY MAP

**gai**  
CONSULTANTS, INC.